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Development and feasibility testing of the mental status examination scale to assess functional status of young, hospitalized children in Pakistan

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ABSTRACT

Background: Mood, cognitive and physical functioning have been widely studied in hospitalized pediatric patients. They fall under mental status examination (MSE). Even though there are several MSE scales, they need to be adapted to meet the needs of hospitalized children.

Objective: The purpose of this study was to describe the development and feasiblity of MSE tool to assess functional status of young children during hospitalization, explore and examine differences of criticalness of illness and age on MSE, before and after play stimulation intervention.

Methods: The Mental Status Examination Scale (MSE-S) was developed in five phases: identification of conceptual framework, item construction, training, testing for feasibility and piloting by trainees. The final tool of MSE-S comprised of a structured observational measure that assessed domains like speech, thought perception, insight, judgement, mood, and interaction. Scores of MSE-S were collected before and after intervention hence, both scores were considered independently (MSE-S Before and MSE-S After). ANOVA and two-way ANOVA was carried out to check the affect of criticalness of illness and age on MSE. Post-hoc analysis of Tukey was carried out to compare pair-wise group differences. Chi-square analysis was done on all the items of MSE-S for criticalness of illness.

Results: The tool was assessed on 351 children aged between newborn to 6 years. Criticalness of illness was divided into intensive care, special care and acute care units. ANOVA revealed significant group differences before intervention ($F(2,510) = 10.0$, $p = 0.000$) and after intervention ($F(2, 510) = 12.7$, $p = 0.000$) for criticalness of illness and significant age group differences on MSE-S before intervention ($F(2,520) = 9.2$, $p = 0.000$) and MSE-S after intervention ($F(2,520) = 9.4$, $p = 0.000$). Two-way ANOVA showed significant difference between the interaction effect of criticalness of disease and age group on MSE-S before ($F(8,498) = 2.5$, $p = 0.010$) and MSE-S after ($F(8,498) = 3.2$, $p = 0.002$).

Conclusion: MSE-S can be feasibly used in an inpatient setting with children to make appropriate treatment plans.

1. Introduction

Healthcare systems worldwide recognize the importance of holistic care for hospitalized children, addressing their physical, emotional, social and spiritual needs (Dick and Pillai, 2010). Hospitalization impacts their appearance and behaviour, speech, mood, affect, thought, perception, cognition, insight and judgement, social interaction, and attitude. These all fall under cognitive and functional skills and furthermore, can be studied in the light of mental status examination.

It would be worthwhile to define cognitive functions in terms of illness. Cognitive function refers to different processes that are performed by the brain. Such processes include attention, learning, memory, information processing, decision making and abstraction (Rengel et al., 2019). Functional skills include physical weakness, poor endurance and dependency on others for daily living tasks such as bathing, drinking and eating (Martin, 1990). When a child is sick or hospitalized, poor health may interfere in one or more processes mentioned. The observation of mental status can, with evaluating the response to treatment, assist in making an appropriate treatment plan (Sorensen et al., 2011a) as well as inform the practitioners about overall recovery.

Functional and cognitive status of pediatric patients can be corroborated by studies on critical illnesses and invasive medical procedures. Invasive medical procedures include pediatric liver transplantation, cell transplantation and neurological problems like hemorrhage and

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traumatic brain injuries (Sorensen et al., 2011b; Kunin-Batson et al., 2015; Ohnemus et al., 2020; Al-Khindi et al., 2010; Davis et al., 2019; Ong et al., 2016). Functional and cognitive delineation in pediatric critical care patients is called post-intensive care syndrome in which memory, attention and executive functioning gets affected along with the development of fear, sleep disturbances and problems in social relationships. For such children rehabilitation needs have been identified (Davis et al., 2019; Ong et al., 2016; Manning et al., 2018; Hopkins et al., 2015). Additionally, cognitive dysfunction has also been observed in children with severe malaria and acute kidney injury (Conroy et al., 2019). While studies on critically ill children and invasive medical procedures provide evidence for poor cognition and functionality, these notions may also be observed and analyzed in children with acute diseases.

Cognitive and functional changes are observed in the treatment of children in both acute and chronic care. Hospitalized children may have psychological and neuropsychological problems as a secondary diagnosis however, not all hospitals in high income regions employ assessment or behavioral interventions (Bardach et al., 2014). Psychological and neuropsychological problems can contribute to acute and chronic illnesses (Hauptman et al., 2019). Length of stay of children with comorbid mood problems is greater as compared to children who do not display any psychological symptoms (Doupnik et al., 2016).

With the recognition of disruption of mood, cognitive and functional issues, there has been an emergence of practitioners like Child Life Therapists in pediatric wards (Jasemi et al., 2017). Interventions that have been used with hospitalized children primarily focus on preparation, medical distraction and developmental plays that are offered by trained professionals (Wojtasik et al., 2018; Li et al., 2016). Positive influence of play and stimulation interventions has been observed in hospitalized children in both developed and developing countries (Delvecchio et al., 2019; Shojaei et al., 2019; Potasz et al., 2013; Mohammadi et al., 2017; Zengin et al., 2020). These interventions help in reducing anxiety and negative emotions such as pain and fatigue that children may have while hospitalized (Wojtasik et al., 2018; Potasz et al., 2013). Such interventions have not only been used with children who have chronic conditions but also with children who have acute diseases or acute medical procedures (Potasz et al., 2013; Mohammadi et al., 2017; Zengin et al., 2020). Interventions such as preparing children for invasive medical procedures and sensory play, have been studied for psychosocial care in hospital setting and some studies have focused on the integration of family centered care for hospitalized pediatric patients (Zengin et al., 2020; da Silva et al., 2017; Shields et al., 2012; Godino-I áñ ez et al., 2020).

Apart from intervention, other factors such as parental perception play an important role in a child's recovery. Parents with fixed mindset perceive their child's pain to be excruciating as compared to parents with a growth mindset. Parents with a growth mindset also seek more medical information (Davidson et al., 2016). Moreover, parents who accept their children's diagnosis are more attuned to the play of their children as compared to those who are not. Such parents offer autonomy to their children and emotional availability which leads to regulation during play (Kain et al., 2020) which then impacts overall psychological functioning of the child during hospitalization.

Like parental interaction, factors like communication between the medical team plays an important role. Consistent communication amongst members of multidisciplinary team helps in preventing misdiagnosis of neuropsychological problems and saves the costs for family and leads towards powerful interventions. This is possible through different evaluations with behavioral observations of patients (Di Renzo et al., 2020).

Type of play, parental interaction, type of diseases and care and consistent communication among medical team members are not the only facets that play an important role in a child's recovery, but also the impact that different psychosocial interventions have on children's cognitive and mental state. When assessments pertaining to psychological issues, cognitive and functional issues are considered, there could be reduced medical complications during hospitalization and readmission (The Children, 2020). Therefore, it is viable to study the development of a mental status examination scale.

Foundation of mental status examination was laid in 1913 when Karl Jaspers suggested that to understand a patient who may have psychopathology, practitioners can observe and ask questions in psychopathological terms. He placed great emphasis on understanding the world from within and make causal inferences with them from 'without'. Pertaining to his theory two scales were created which entailed interviewing and observation of patients based on questionnaires (Huline-Dickens, 2013). One semi-structured interview questionnaire was created by Wing (1967) that contained 140 items and were scored on 3 point or 4-point rating scales. The scale has been converted into Schedules for Clinical Assessment in Neuropsychiatry (SCAN) and is recognized by UN for making diagnosis based on the criteria of International Classification of Diseases (ICD) and Diagnostic Statistical Manuals (DSM) (Aboraya et al., 1998). The questionnaire assessed appearance, cognition, thought content, intelligence, mood and affect. The findings on these help with the diagnosis.

Based on the findings of SCAN, Akiskal et al. (2008) (Akiskal et al., 2008) has suggested that mental status examination (MSE) can be used in medical setting. There are three different ways through which illness affects psychological wellbeing of people. He suggested that mental functioning gets impaired due to illness, medication can impact mood and cognitive capacity and there are personally disabling psychosocial consequences of illness (UNICEF: Paksitan, 2018). Daniel and Gurczynski (2010) (Daniel and Gurczynski, 2010) laid the importance of incorporating mental status examination in healthcare setting arguing that it is important to incorporate MSE when patient is being assessed or when any changes are observed. For a successful assessment of patients admitted in hospital, therapist must show empathy, unconditional positive regard, and genuineness. These aspects lead towards rapport building which helps in assessing the mental status. The assessment is based on observations and subjective experience of the patient. The two are linked. There are different domains in MSE and they are linked to one another as can be observed in Fig. 1 and are described in more detail in the methodology section of conceptual framework. Other aspects that help with diagnosis include psychosocial and psychiatric history, medical history, cultural factors, and developmental stage of the child (Di Renzo et al., 2020; Daniel and Gurczynski, 2010).

The most popular MSE scale is the Mini-mental Status Examination Scale. It measures cognitive functioning of individuals (Bernard and Goldman, 2010). This scale has also been adapted for children. Measures such as Mini-mental State Pediatric Examination, which measures a child's cognitive functioning has been practiced on pre-schoolers aged 36–72 months and it was found out that in cases where exhaustive cognitive assessment cannot be conducted, such a measure can be used where children show attentional and behavioral problems (Peviani et al., 2020). Even though such measures have not been extensively used in hospital settings and only with children who have observable symptoms of developmental delays and mood disturbances, less exhaustive tools can be used to assess children so that they can receive adequate care. The hospital setting requires that not only cognitive functioning be measured as in the Mini-mental State Pediatric Examination, but also the mood of children (Peviani et al., 2020). MSE of children that comprises of domains in mood, cognitive and functional skills of children can help in making adequate intervention plans and can also assist the multidisciplinary team whether interventions are effective in improving health of the child both, physically and psychologically.

The current study aims to describe the development and feasiblity of a mental status examination tool to assess functional status of young children during hospitalization and examine differences of criticalness of illness and age on MSE, before and after play stimulation intervention.

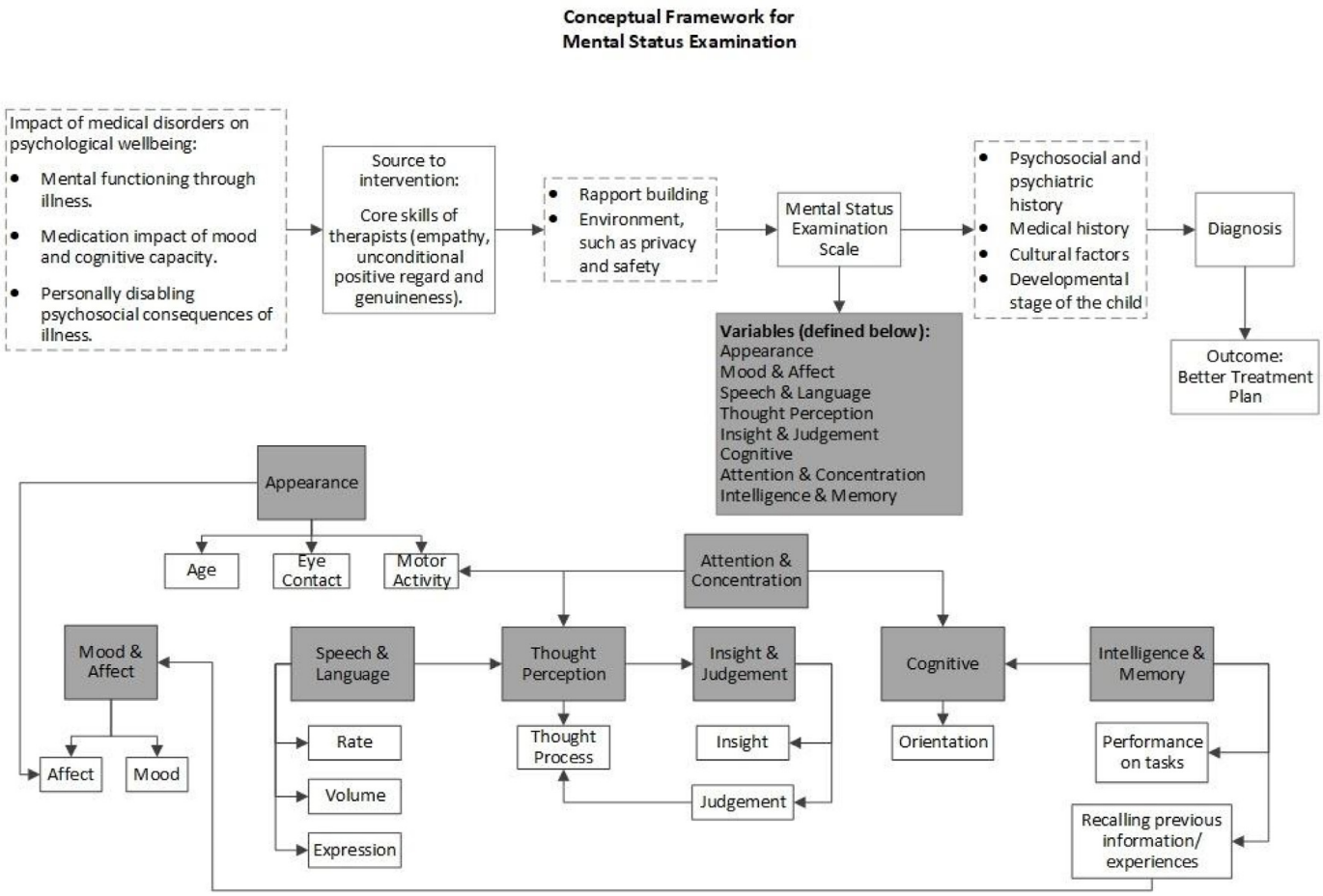

Fig. 1. Impact of medical disorders on the mental state of children.

2. Methodology

2.1. Setting and study design

Mortality rate in Pakistan in 2017 was 75 deaths per 1000 births (UNICEF: Paksitan, 2018). Many children who are admitted to hospitals have complex healthcare needs and some of them require highly technical interventions (Hewitt-Taylor, 2005). According to 2018 statistics by WHO, children under the age of five died from diseases like acute respiratory infections, birth asphyxia, diarrhea, congenital anomalies and infant prematurity in Pakistan (WHO, 2019).

The Mental Status Examination Scale (MSE-S) was developed as part of the Play Stimulation Program in a children's hospital in Pakistan as an accompanying tool as well as to standardize it for routine use by the psychologists and nurses (Rasheed et al., 2021). The hospital is a not-for-profit organization where people from all over Pakistan and neighboring countries like Afghanistan and Iraq visit for treatment and intensive medical procedures. The hospital serves patients from diverse socio-economic backgrounds. It is a tertiary care center treating patients newborns to 18 years of age. The hospital does not only provide specialized medical health services but also offers treatment in the form of rehabilitation care that involves services like physiotherapy and play stimulation. Children with various conditions like genetic disorders, heart diseases, neurological problems, cancer, infections, and metabolic disorders are hospitalized here. Children hospitalized in the general ward, semi-private and private wings and in special care, intensive care and critical care units were given interventions. Children aged newborn months to 6 years were included in the study, which was conducted between March 2018 and October 2019, and was approved through the institute's ethical research committee. The package and scale development work began in 2017 (Rasheed et al., 2021).

2.2. Sample

The sampling technique was purposive sampling. Children between the age range of newborn to six years who were admitted in acute and critical care were included in the study and children for whom consult was raised by their physicians were also offered therapy to improve mood, functional and cognitive functioning of children. All patients who were referred were also included in the study. Children from general ward and semi-private wing were selected by the trainees' convenience.

2.3. Development of the mental status examination-scale form (MSE-S)

The development of MSE-S consisted of five phases.

2.3.1. Phase 1: identification of a conceptual framework

The development of MSE form began with identification of conceptual framework. There are certain domains in MSE that are linked to one another and observation in one domain can be a predictor of the performance on another domain. Similar pattern as that of the adults MSE can be used with paediatric patients. Appearance is the first observation that a therapist notes when interacting with a patient. Through the role of appearance, a practitioner can deduce the affect of a person from the domains of mood and affect, as well as attention and concentration based on motor activity. Mood and affect also impacts memory such as recalling information during hospital stay or before the hospital stay. Similarly, to perceive appropriate thought perception, therapist makes an appropriate

note of speech and language. If speech is understandable, thought and perception can be perceived after which the therapist will be able to understand insight and judgement which focus on awareness of problems and how a person is trying to change behavior based on awareness, for example doing exercises on bedside for motor movements. Assessment of cognition is also based on attention and concentration. If the child can concentrate, he will be able to relate information about person, place and time, for example for how long a child can immerse in one activity or game or if he gets distracted. Similarly, intelligence and abstraction are affected by cognition such as playing puzzles and reading ability (Daniel and Gurczynski, 2010).

2.3.2. Phase 2: item construction

Items on MSE forms typically contain the domains of three main areas: physical, emotional and cognitive. Areas that fall under physical are the general appearance and motor activity. Subdomains of emotional are mood and affect, thought perception, insight and judgement. Orientation, attention/concentration, speech/language, memory and intelligence/abstraction fall under cognition (Daniel and Gurczynski, 2010). Method of assessing MSE is during the interview phase in which the therapist tries to build rapport with the patient during which the patient is assessed (Daniel and Gurczynski, 2010).

With regards to administration of MSE in a clinical setting, our study called for a less exhaustive (Peviani et al., 2020) MSE tool that was not laborious to administer and was easily applicable after short training. Due to the number of patients that were to be seen by trainees every day in our study, citing specific behaviors observed and subjective experience of the patients was deemed to be time consuming hence a form was created that allowed trainees to fill in a timely manner.

MSE-S included demographic information related to the child such as diagnosis and parents' age. Items were constructed across all three broad domains of MSE. Some items included observation before and after the session such as motor skills, communication, and attention to ascertain effect of the play session. Some were measured via multiple response sets such as mood, transition out of session and theme of play (Soltan, 2017). Responses on multiple response sets were further measured by multiple choice questions in which the raters had to choose from the options of positive, negative, ambivalent, and variable. By positive it meant positive behavior and mood shown by the child, negative denoted negative behavior or mood, ambivalent means showing both negative and positive mood and variable means multiple moods shown. All items on the scale were scored differently as the measures were accounted for differently. Maximum score that the participants could achieve on the scale is 60. Total score on the scale was calculated by merging general appearance, motor skills, speech, communication, mood and affect, orientation, thought content, insight and judgement and type of interaction with caregivers and therapists. The scale is a combination of questions that require rating and branching scales (DeCastellarnau, 2018). The scale is attached as a file in the supplementary document.

The form was altered twice in this phase. Once it was after the administration during the first rotation of trainees (details are mentioned below). The second revision was when the data was being compiled and managed. First omission was due to word jargon in which trainees had difficulty in understanding with. Items such as soiled grooming, echolalia and monotonous speech quality were removed. Other terminologies that were excluded are dissociation, agnosia, magical thinking and derailment. Items from MSE-S were taken from various sources found on internet which included references from universities based in North America and as well as some private clinics (AACAP, 1008; Patrick; University of Maryland). Outline of the domains and sub-domains are given in Table 1.

2.3.3. Phase 3: training of the trainees

Trainees were students enrolled in a master's program of clinical psychology from a local university. They were initially trained in which they were introduced to the principles of play stimulation package which included rapport building as suggested by the literature on MSE (Rasheed et al., 2021). They were then asked to observe two to three children and their parents in the ward to assess their interaction as well as behavior after which there was a discussion on what was observed. After discussion, they were introduced and trained to use MSE-S forms created for the package along with other behavioral observation forms and their scoring. Behaviour observation forms were created to observe the behaviour between children and their caregivers during their transactions. Different domains were explained to them and trainees reviewed the sections.

After training of the intervention package, trainees took sessions by offering interventions on bedside with their supervisor and filled and scored MSE-S forms and behavioral observation forms with the help of their supervisor in Children's Hospital. Intervention package was used to give intervention to children based on the age range and their interaction with caregivers. The intervention was offered by trainees and they filled and scored the forms. Forms were also discussed in debriefing meetings that were held when the supervisor would visit children on their bedside with trainees. Aspects of what was assessed on the MSE-S forms were discussed and linked to interventions that were used. Some of the domains of MSE-S form were mentioned in patients' inpatient files so that medical physicians, medical fellows and residents could refer to them.

Table 1
MSE-S domain and subdomain item examples and score.

Domain	Sub-domain	No. of item with examples	Examples of Scoring Range based on different questions
Demographic		Parental age, heritage, birth order	
Physical	General appearance	3, body type, weight	0–2
	Motor activity	2, fine and gross motor	0–3
Emotional	Mood and affect	3, mood, emotional valency, affect	0-1, 0–5 and 0-3
	Play observation	6, type of play, theme of play, transition out of session, valency	0-1, 0–3 and 0-5
	Self-soothing capacity	1, appropriate coping strategies	0–3
	Interpersonal behaviour	4, with caregiver, with therapist, valency	0-1 and 0-5
Cognitive	Orientation	3, person, place and time	0–3
	Attention	'1, appropriate, selective attention and distractibility	0–2
	Speech/ language	4, rate, volume, expressive and receptive language	0-3, 0-2
	Intelligence	1, average, borderline	0–3
	Insight and judgment	2, insight and judgement	0–2

2.3.4. Phase 4: testing

Purpose of testing was to check the feasibility of administering MSE-S forms after provision of intervention on bedside. It was to assess what items could be included and what were overlapping or confusing for trainees.

Initially the trainees were asked to rate MSE-S on hardcopy, however later it was created on Google Forms for the convenience of managing data. After forms were edited, they were administered on patients in the ward through tablets. Children who were assessed before, were not reassessed because they were discharged from hospital and results would not have been the same due to the prognosis of treatment. It took approximately five to ten minutes to finish the form. The forms were then shared with consultants if the patient was referred. Items that were difficult for consultants to understand were defined in emails with tsoftcopies. Any other queries that consultants had about the form were answered on emails.

Second omission was due to inappropriate scoring that did not show the true picture of mood, play observation and interpersonal behaviour. This change was made as scoring was difficult. Multiple moods were rated for one child such as happy, sad and irritated. The investigators suspected that out of three if only one mood would be counted, it would not give a true depiction of the differing expressions of children. Hence, mood valencies were added to ensure that items from the above-mentioned domains were accounted for.

2.3.5. Phase 5: piloting by trainees

Trainees were asked to pilot the scale in different units where they were seeing patients. They were expected to fill all items in the forms and were asked not to offer more than two interventions from icebreaker, main and wrap-up activities from the package. They were also given instructions of not marking more than three mood options in the form as affective experience is usually bivariate (Larsen et al., 2001).

The scale was administered after intervention was given. During interventions the trainees, parents and children would interact with one another after which the trainee would assess mental status of children before intervention was given as well as after intervention was given and would rate.

During piloting phase it was noted that children had various feelings during session after which some trainees marked more than one mood for overall mood, transition out of session and theme of play. Due to this, in the second phase of omission, another category of multiple-choice questions were created in which the investigator had to choose from the options of positive, negative, ambivalent and variable. By positive it meant positive behavior and mood showed by the child, negative denotes negative behavior or mood, ambivalent means showing both negative and positive mood and variable means multiple moods shown (Kauschke et al., 2019). This made scoring on the scale easier.

2.4. Data management

Data from the forms were collected via Google Forms that were filled by trainees. Data was then compiled on Microsoft Office Excel software where it was cleaned, and diseases and names were rechecked with discharge summaries submitted to hospital's online portal of the patients. Data was in text form and to make it into numerical form, it was coded and recoded by the first author for statistical analysis.

2.5. Data analysis

Descriptive statistics has been used to summarize quantitative data. Scores of MSE-S were collected before and after intervention hence, both scores were considered independently (MSE-S Before and MSE-S After). Differences on scores on MSE-S have been explored by child's age as well as criticalness of illness using ANOVA. Test of Chi square was run to see whether criticalness of illness has an impact on different domains of MSE-S.

Inferential tests of paired samples *t*-test and one -way ANOVA were run to see significance of difference in scores of MSE-S based on the criticalness of illness as well as the age group. To see the effect of age on criticalness of illness, one-way ANOVA was carried out by splitting the file into different age groups. Similarly, to assess effectiveness of criticalness of illness on different age groups, the file was split into different categories of criticalness and the test of one-way ANOVA was run. Two-way ANOVA was used to test the sensitivity of age and illness severity on over all scores of MSE-S before and MSE-S after. Post-hoc test of Tukey was also carried out to check differences between age groups and criticalness of illness. ANOVA was not used to check group mean differences for domains; however chi-square was used to assess domains on criticalness of illness. This test enabled the authors to understand whether significant differences were observed between groups. Tests were run using PSPP and Jamovi (GNU Project, 2015; The Jamovi Project, 2021).

3. Results

3.1. Demographic variables

In all 351 children were seen and given interventions. Some children received more than one therapeutic session during their stay in hospital, hence in all 525 therapeutic sessions were given. The table given below demonstrates that most of the children seen belonged from the disease group of cardiovascular diseases 98 (30.1%), followed by infectious diseases 51 (15.6%) and respiratory diseases 46 (14.1%). Most of the children seen belonged from the age bracket of four to six years 128 (36.5%). Majority participants were male 208 (59.3%) than females 143 (40.7%). Mean age of mothers was 30.54 whereas for fathers it was 35.8. Most of the children that were observed and were given interventions were in the acute care 391 (76.2%). Acute care comprised of children admitted in the general ward, semi-private and private wings. 351 (67%) children received at least one session throughout their hospital stay. Of a total of 525 sessions, 361 (68.8%) mothers were the attendants on bedside. Around 53.56% (188) of the sample size spoke *Urdu* (the national language). The details of demographic variable are given in Table 2.

3.2. Descriptive analysis of the MSE-S

Table 3 gives the mean of MSE-S of all children admitted in hospital before and after intervention. Significant differences were observed in all the groups before intervention: intensive care unit (ICU) (M = 29.6, SD = 9.3), special care unit (SCU) (M = 36.3, SD = 9.7) and acute care unit (ACU) (M = 36.7, SD = 10.4). Similarly, after the intervention, differences in MSE-S were observed in all groups: ICU (M = 34.9, SD = 8.4), SCU (M = 42.7, SD = 9.7) and ACU (M = 42.8, SD = 10.5).

It also shows descriptive statistics of children based on age group and severity of illness. The total score in MSE-S was calculated as 60. Children of all age groups before intervention on average scored lower in ICU (newborn to 6 months M = 29.0 (±8.1) 7–12 months M = 23.5 (±9.7), 13 months–24 months M = 32.4(±6.6), 2–3 years M = 32.8(±10.4) and 4–6 years M = 27.4,(±8.1) as compared to ACU (newborn to 6 months M = 28.1(±10.4), 7–12 months M = 32.0 (±10.1), 13–24 months M = 35.8(±10.0), 2–3 years (M = 34.4(±10.0) and four to 6 years M = 37.9 ± 9.0). Similarly, children of all age groups on average scored lower in ICU after intervention (newborn to 6 months M = 36.0 (±6.1), 7–12 months M = 31.0 (±8.9), 13–24 months Median = 40.0, 2–3 years M = 35.3 (±10.6) and 4–6 years M = 31.0 (±5.8) as compared to ACU (newborn to 6 months M = 34.0 (±9.8), seven to 12 months M = 37.7(±9.1), 13–24 months M = 41.4(±8.4), 2–3 years M = 41.5(±11.1) and 4–6 years M = 43.8 (±9.7)). Data of MSE-S after children aged newborn to 6 months in SCU was not normally distributed and neither the data of children aged 13–24 months in ICU.

Chi-square analysis was also carried out on all items of MSE-S based on the criticalness of illness. The table is given in supplementary material. The criticalness of illness impacted eye contact (χ (4) = 30.8, p = 0.000), expressive language before intervention (χ (4) = 11.7, p = 0.02), expressive language after intervention (χ (4) = 12.9, p = 0.012), mood after intervention (χ (10) = 30.7, p = 0.001), attention (χ (4) = 16.9, p = 0.002), self-soothing capacity for the session (χ (4) = 9.7, p = 0.045), thought content (χ (6) = 25.3, p = 0.00), insight (χ (4) = 13.0, p = 0.012), judgement (χ (4) = 20.5, p = 0.00), orientation of time (χ (2) = 6.6, p = 0.047), transition out of session (χ (8) = 31.2, p = 0.00), relationship with caregiver after (χ (10) = 20.1, p = 0.028) and self-perception (χ (2) = 10.5, p = 0.00).

3.3. Testing group differences

The tests of ANOVA and two-way ANOVA was carried out on the scores of MSE-S before and after intervention to see the significant difference between the criticalness of the illness as well as in the interaction

Table 2
Demographic details of the participants.

Domain	N (%)/Mean (SD)
Diseases	
Cardiovascular Diseases	98 (27.9)
Infectious Diseases	51 (14.5)
Respiratory Diseases	46 (13.1)
Gastroenterological Disorders	29 (8.3)
Cancer	20 (5.7)
Nephrotic Disorders	20 (5.7)
Neurological Disorders	17 (4.8)
Orthopedic Disorders	10 (2.9)
Others	35 (10.0)
Age	
0–6 months	44 (12.5)
7–12 months	54 (15.9)
13–24 months	45 (12.8)
2–3 years	80 (22.8)
4–6 years	128 (36.5)
Gender	
Males	208 (59.2)
Females	143 (40.7)
Parental Age	
Father's Age	209, 35.8 (7.0)
Mother's Age	212, 30.54 (5.8)
Ward	
Critical Care	47 (9.0)
Special Care	75 (14.3)
Acute Care	391 (74.5)
Length of stay (days)	315, 13.3 (15.8)
Number of Sessions	
1	351 (66.9)
2	103 (19.6)
3	30 (5.7)
4	15 (2.9)
5–12	25 (4.78)
Attendant's Relationship to Child	
Mother	361 (68.8)
Father	78 (14.9)
Grandmother	22 (4.2)
Aunt	15 (2.9)
Brother	3(0.6)
Uncle	3 (0.6)
Grandfather	2 (0.4)
No caregiver	41 (7.8)
Language	
Urdu	188 (53.6)
Punjabi	49 (14.0)
Sindhi	40 (11.4)
Pashto	25(7.1)
Balochi	9 (2.3)
Other	40 (11.4)

Note. From the data, following were missing: disease = 15, birth order = 52, criticalness of the illness = 12, father's and mother's age 142 and 139 missing entries for father's and mother's age, and length of stay = 36. Data for 'ward', 'number of sessions' and 'attendant's relationship to child' are based on the total number of sessions provided (525). Some demographic data is missing as it was not collected when the patient was studied. Session numbers are based on the number of sessions provided to the child during hospital stay.

of age and illness criticalness. ANOVA revealed significant group differences in MSE-S before intervention, F (2, 510) = 10.3, p = 0.00, in terms of criticalness of illness. Similarly, significant group differences in MSE-S after intervention, F (2, 510) = 12.7, p = 0.000, in terms of criticalness of illness was also observed. ANOVA also revealed significant age group differences on both before (F (2,520) = 9.2, p = 0.000) and after (F (2,520) = 9.4,p = 0.000) scores on MSE-S.

3.4. Interaction differences between criticalness and age

Two-way ANOVA showed a significant difference between interaction effect of criticalness of illness with age range on MSE-S before, F (8, 498) = 2.5, p = 0.010. Significant difference was also observed in two-way ANOVA between the interaction effect of criticalness of illness and age range on MSE-S after, F (8, 498) = 3.2, p = 0.002.

Table 3
Differences on Mental Status Examination Scale between age and severity of illness for before and after intervention.

Domain	N	MSE-S (Before) Mean ± SD	F (p)	MSE-S (After) Mean ± SD	F (p)
Criticalness					
Intensive	47	29.5 ± 9.3	10.3	34.9 ± 8.4	12.7
Special Care	75	36.3 ± 9.7	(0.000)	42.2 ± 9.7	(0.000)
Acute	391	36.7 ± 10.4		42.8 ± 10.5	
Age					
0–6	60	31.4 ± 11.4	9.2	37.1 ± 10.6	9.4
7–12	78	32.2 ± 10.7	(0.000)	38.3 ± 9.8	(0.000)
13–24	76	35.9 ± 10.2		41.9 ± 8.9	
25–36	112	36.2 ± 10.0		43.2 ± 11.1	
37–60	199	38.6 ± 9.5		44.4 ± 10.0	

One-way ANOVA showed significant differences on the scores of MSE-S based on age group on criticalness. Scores on MSE-S before for children aged 0–6 months (F (Rengel et al., 2019; Hysing et al., 2007) = 3.2, p = 0.049), children aged 7–12 months (F (2,74) = 3.6, p = 0.032), scores on MSE-S after for children aged 13–24 months (F (Rengel et al., 2019; Lundh et al., 2010) = 4.7, p = 0.012) and significant differences were observed for children aged 48–72 months on MSE-S before (F (2, 195) = 11.0, p = 0.000) and MSE-S after (F(2, 195) = 15.3, p = 0.000). Scores of MSE-S based on criticalness of illness on age group also significantly differed. Significant scores were observed in children admitted in semi-critical care unit: MSE-S before (F (4,70) = 2.8, p = 0.035) and MSE-S after (F (4,70) = 4.1, p = 0.004). Children of different age groups also showed significant differences in scores of acute care before (F (4,386) = 10.0, p = 0.000) and after (F(4, 386) = 9.9, p = 0.000). Details of the analysis are given in Table 4.

3.5. Multiple comparison analysis of illness criticalness and interaction effects of illness criticalness with age group

Table 5 shows post hoc analysis after ANOVA. Post hoc analysis showed that there was a significant difference between the MSE-S scores of critical care with special care (p = 0.001) and acute care (p = 0.00) but no significant difference was observed between MSE-S scores of special care and acute care for before the intervention scores. Post hoc analysis also revealed a significant difference between the scores of critical care and special care (p = 0.001) and critical care and acute care (p = 0.000) after the intervention. No significant difference was observed between acute care and special care (p = 0.994).

Post hoc analysis after two-way ANOVA was also carried out to check significant differences between interaction effect of criticalness of illness and age range. Significant differences were observed before and after intervention between the interaction effect of 7–12 months old children admitted in ICU with 4–6 years old in SCU before (p = 0.003) and after (p = 0.008) and children of different age ranges admitted in acute care before and after: 13–24 months (before: p = 0.006; after: p = 0.047), 2–3 years (before: p = 0.018; after: p = 0.028) and 4–6 years (before: p=<0.001; after 0.001). It was also observed that children aged 4–6 years admitted in ICU had a significant difference in score on MSE-S before (p = 0.0002) and after (p=<0.001) with children of same age admitted in ACU. A similar trend was also observed in infants aged newborn to six months admitted in ACU with 4–6 years old admitted in SCU (before: p = 0.008; after: p = 0.002) and children of different age ranges admitted in ACU (13–24 months: before (p = 0.011) and after (p = 0.019); 2–3 years: before (p = 0.039) and after (p = 0.004); 4–6 years: before (p=<0.001) and after (p = 0.001)). Scores of children aged 7–12 months admitted in ACU had a significant difference in scores with children aged 4–6 years in ACU before (p=<0.001) and after (p = 0.004). There was a significant difference in scores of children newborn to 6

Table 4
Interaction differences between age and severity of illness for before and after intervention MSE scores.

Age MSES-S Before MSE-S After	Intensive care N, Mean (SD)	Special Care N, Mean (SD)	Acute care N, Mean (SD)	F (p) between criticalness for age
0–6 months				
Before	6, 29.0 (8.1)	9, 37.8 (10.4)	43, 28.1 (10.4)	3.2 (p = 0.049)
After	6, 36.0 (6.1)	9, 42.7 (10.8)	43, 34.0 (9.8)	2.7 (p = 0.70)
7–12 months				
Before	11, 23.5 (9.7)	9, 29.9 (9.7)	57, 32.0 (10.1)	3.6 (p = 0.032)
After	11, 31.0 (8.9)	9, 42.7 (10.8)	57, 37.7 (9.1)	2.8 (p = 0.070)
13–24 months				
Before	7, 32.4 (6.6)	10, 28.2 (11.1)	54, 35.8 (10.0)	2.64 (p = 0.079)
After	7, 39.7 (8.5)	10, 32.5 (8.6)	54, 41.4 (8.4)	4.69 (p = 0.012)
25–36 months				
Before	6, 32.8 (10.4)	13, 34.1 (7.43)	90, 34.43 (10.02)	0.010 (p = 0.909)
After	6, 35.3 (10.6)	13, 43.00 (8.64)	90, 41.51 (11.06)	1.10 (p = 0.335)
48–72 months				
Before	17, 27.4 (8.1)	34, 36.8 (8.3)	147, 37.9 (9.0)	11.0 (p = 0.00)
After	17, 30.9 (5.8)	34, 43.4 (7.9)	147, 43.8 (9.7)	15.3 (p = 0.00)
F (p) (between age groups for criticalness				Interaction F-value for total sample
Before	1.7 (p = 0.160)	2.8 (p = 0.035)	10.0 (p = 0.00)	2.5 (p = 0.010)
After	2.1 (p = 0.099)	4.2 (p = 0.004)	9.9 (p = 0.00)	3.2 (p = 0.02)

Table 5
Multiple Comparison of the scores of Mental Status Examination Scale before and after based on severity of illness.

	Criticalness		Mean Difference	SE*	p-value
MSE-S Before	Critical Care	Special Care	−6.7	1.9	.001
		Acute Care	−7.1	1.6	.000
	Special Care	Critical Care	6.7	1.9	.001
		Acute Care	−0.4	1.3	.950
MSE-S After	Critical Care	Special Care	−7.8	1.9	0.001
		Acute Care	−7.9	1.6	.000
	Special Care	Critical Care	7.8	1.9	0.001
		Acute Care	−0.08	1.3	.998

*SE=Standard Error.

months admitted in SCU with children aged 13–24 months admitted in ICU before the intervention (p = 0.050). After intervention, significant differences in scores of children aged 4–6 years in ICU with children of the same age in SCU (p=<0.001) was observed. A similar trend was observed in children aged 13–24 months in SCU with children aged 4–6 years in ACU (p = 0.025). Children aged 2–3 years admitted in SCU had a significant score difference with 4–6 years old admitted in ICU (p = 0.048). Children aged 4–6 years and admitted in ICU had a significant score difference with children aged 13–24 months in ACU (p = 0.008) and 2–3 years old in ACU (p = 0.003).

4. Discussion

The aim of the study was to assess whether MSE-S can be feasibly used to assess psychological, cognitive, and physical functionality of children admitted in hospital by psychology trainees. Findings indicated that MSE-S was a feasible and useful tool in paediatric in-patient setting to assess the behavioral needs of children and for the provision of an appropriate treatment plan. Tools that measure mood and cognition of children help in deciphering the mentation of children. They help in identifying the impact that severity of illness or type of illness has on mental functioning of children.

The study highlights the importance of building rapport with children while examining mental status as without the rapport, the understanding of MSE may be very subjective rather than objective which leads towards the researcher's own subjective feeling towards a child (experimenter bias). The understanding of mental status by building rapport also aided trainees to adjust to a new population like hospitalized children. While building rapport with the child, therapist can decrypt cognitive functioning of the child while he is interacting with environment as well as his mood by way the child accepts a newly introduced activity. In adult settings, to understand mental status, therapists build rapport with clients by introducing themselves and if the client is still uncomfortable, they give them an object to hold onto such as a glass of water which gives them comfort. Initial interview starts off with open-ended questions and then later in session, questions become close ended (Forrest and Shortridge, 2021). Similar, pattern was followed in the paediatric setting. The MSE-S was assessed when trainees met the children and their parents. They made the observation of children's response towards activities that were offered to them or neutral questions that were asked from them (Lempp et al., 2012). Children were also assessed initially by the way they interacted with their caregivers as well as their trainees. Their type of speech and receptive and expressive speech were assessed when they were introduced to an activity. Their mood and affect were assessed by facial and tonal expressions. Children were once again reassessed after activities ended to see whether any changes were observed.

The findings indicated that scores of children differed based on how critical the child's condition was. Children who were in ACU scored more on MSE-S than children who were in ICU; however, children aged newborn to six months scored higher in ICU than ACU. One perception in the difference of score could be the type of care received and what the children felt as well as their reaction towards the care that they received. It has been reported that environment of hospitals such as noise, interaction with the staff, activities, ability to rest and reduction of pain are some of the elements that contribute towards the development of different attitudes when children are hospitalized (Loureiro et al., 2021). State anxiety is higher in children who are hospitalized as compared to children who are not hospitalized. Also, as compared to non-hospitalized children, hospitalized children show more cognitive restructuring, however hospitalized children are more restrictive in their affect expression (Loureiro et al., 2021). Hospitalization leads to development vulnerability due to physical and emotional stress that children struggle with (Williams et al., 2019).

Severity of illness impacted the mood of children after intervention as well as their transition out of session. It has been studied that children who have chronic illness are at the risk of developing emotional and behavioral problems as compared to children who are not ill (Hysing et al., 2007). In another study it was found out that mood problems like depression and anxiety have a negative impact on illness (Balon, 2006). Interventions offered to children during hospitalization enhances the mood of children (Kaminski et al., 2002).

In terms of the criticalness of illness, score varied among the children who received different types of care. Children who were admitted in ICU scored significantly lower than children admitted in SCU and ACU which denotes that severity of illness aggravates a child's psychological, cognitive, and physical functioning. Children admitted in ICU develop post-intensive care syndrome. It is characterized by the development of symptoms of post-traumatic stress, fatigue, sleep disturbance and the risk of developing psychiatric illness (Als et al., 2015). Other negative impacts of admission of children in ICU include physical impairments, cognitive impairment and mental impairment like depression and anxiety (Inoue et al., 2019). Hence, to reduce the risk assessment and interventions are recommended for a smooth transition.

It was also observed that there was a significant score difference in children of all age groups when children received care in ACU and SCU. No differences in age groups were observed when children received care in ICU. Group differences after discharge from ICU are more prevalent (Rennick et al., 2004). A study found that individuals who were asked to recall their memories from ICU stay, reported that they were unable to recall anything, and fifty percent said that they had confused memories and disorientation (Chahraoui et al., 2015). Moreover a difference in the scores can also be because of sample size, as sample size also impacts significance (Anderson et al., 2017).

Another observation was that older children had higher scores than younger children which was expected. This is also supported by another study on mini-mental status examination of children in which scores on the scale increased when children grew older (Moura et al., 2017). There are various factors that influence different scores of mental status of children of different age groups. Some factors include the developmental levels and other factors such as experiences in life (Thomas et al., 1997). Even though behavior is influenced by various experiences and developmental levels, validity of the scale becomes questionable, however the objectivity of observations can be corroborated with the way the scale has been objectified based on the difficulties that children face while hospitalized.

There were several lessons that were learnt during the construction of the MSE-S. Creating the tool included the scoring system such that which item would be scored zero and the others subsequently. For example, the items that were dichotomous were easier to score than those that had multiple choices. For items pertaining to multiple choices which include observations such as weight with observations like age appropriate, underweight, and overweight. The literature was studied for the more aversive ramifications of being overweight and underweight and the scores were given based on the findings such as children who are overweight are at a higher risk of suffering from type 2 diabetes and cardiovascular diseases later in life, however children who are overweight and underweight have issues in academic performance and peer relationships (Henninger, 2008; Al-Lahham et al., 2019). Training the trainees in filling the form was another problem that the investigators faced. Investigators had to ensure that there was consistency in the way some of observations were rated. For instance, at times the trainees would mark more than three different moods in one session of 20 minutes after which it would become difficult for investigators to interpret what was observed. For this reason, valencies were introduced. It was deduced that children when hospitalized can switch their moods based on perception of environment such as the nurses or the doctors entering and leaving their space, blood pressure monitoring, etc. Due to such interruptions mood and affect would often change during the session.

MSE-S was developed as an observational tool to help assess children's cognitions as well as mood and affect. One limitation of the tool is its susceptibility to observation bias. Observation bias was minimized by provision of training however inter-rater reliability was not assessed. Inter-observer reliability was not recorded, and it was not possible due to logistic concerns in the hospital setting. Observational bias could have been addressed by more in-depth training but it was not possible as trainees rotated for 6 weeks. Another shortcoming of this scale is that it has not been validated against other scales which questions whether constructs measure what they intend to measure. Scoring of the items was based on the judgement of therapist. However, weekly debriefing meetings were imminent to discuss the items and contribute to standardization (Burri et al., 2021; Lundh et al., 2010). Intervention plans were also managed by the same trainees ultimately, due to which a margin of difference was acceptable. Concrete responses were not recorded and neither the observation items gave description of the frequency of a particular behavior or the ways particular behaviors could be tested. Further studies on validation are needed that would help in comparing the MSE-S scale. Modification of the scale would also be helpful in which frequency of behavior or description of observations are given for scoring.

5. Conclusion

It can be concluded that MSE-S can be feasibly used in an inpatient setting with children with indication of preliminary validity. MSE tool can aid the physicians and parents in decision making for medical procedures and to develop an appropriate treatment plan after discharge and the child's future coping and development.

Ethics approval

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CRediT authorship contribution statement

Vardah Noor Ahmed Bharuchi: Methodology, Formal analysis, Data curation, Investigation, Writing – original draft, Project administration. **Muneera A. Rasheed:** Conceptualization, Methodology, Investigation, Writing – review & editing, Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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