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Do parental stimulation practices modify the effect of child’s health status on early developmental risk? Findings from a hospitalized cohort

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ABSTRACT

The current study conducted in Pakistan aimed to test if parental stimulation practices modify the effect of general child health status on early developmental risks in hospitalized children. Development was assessed using the Survey of Well-being of Young Children. Child health status was a global rating on a Likert scale. Parental engagement was categorized based on the number of activities with their children (low ≤ 3, high > 3). A total of 231 children were assessed. Children with poor health status were reported to be 1.9 (95% Confidence Intervals [CI] 1.4–2.8, $p = 0.000$) times at risk of developmental delay by parents who had lower engagement and about 3 times (3.63 for mothers CI 1.79–7.37, $p = 0.003$; 2.96 for fathers CI 1.17–7.49, $p = 0.027$) significantly at risk of behaviour–emotional concerns by parents with higher engagement. The authors conclude that parental engagement and developmental screening can be incorporated as part of in-patient paediatric assessment.

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Survey of Well-being of Young Children; early childhood development; parental stimulation; child health status; developmental risk

Millions of children worldwide suffer from health conditions and diseases that can potentially affect their quality of life (World Health Organization [WHO], 2020). Some of these may be chronic conditions while some children may have higher rates of morbidity of acute illnesses (De Walt et al., 2015). Acute hospitalization due community-acquired infections, such as respiratory, gastrointestinal or bloodstream infections, and acute complications of noncommunicable diseases and neurodevelopmental conditions, are common reasons of admission in pediatric hospitals/units (WHO, 2018). Psychological and socioemotional distress related to a child’s health status can adversely impact the process of recovery (Shields, 2001). Moreover, these experiences adversely affect children’s development and behaviour, particularly with prolonged or multiple admissions (Coyne, 2006; Leidy et al., 2005). Dysfunctional parental coping strategies, coupled with limited emotional support resources in stressful situations, can further impair hospitalized children’s healing and recovery, and long-term developmental outcomes (Nabors et al., 2018; Stremler, Haddad, Pullenayegum, & Parshuram, 2017). Other factors such as child’s age, nature of injury or disease, duration of hospitalization and the level of psychosocial stimulation (Kosta et al., 2015; Melnyk, 2000; Weiss et al., 2017) can determine the developmental trajectories of children with poor health status. Realizing the need for addressing developmental needs, psychosocial support in the form of play- and art-based therapy, and counseling for stress management and relationship-building are initiated during hospitalization in high-income countries (HIC) (Boles et al., 2020).

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While there is a significant emphasis on the health sector to promote optimal caregiving practices for improved early childhood development (ECD) outcomes in low-and middle-income countries LMIC (Black et al., 2017), not much is known about predictors of developmental risk in sick children. Similarly, there is insufficient evidence about the mitigating role of parental stimulation practices characterized by play and learning activities for developmental risk in children with poor health status. Hence, the evidence on the implementation of appropriate interventions during hospitalization in the LMIC context is also lacking (Smythe, Zuurmond, Tann, Gladstone, & Kuper, 2021). Supporting young children during their early development – not only for chronic disease management, and during acute hospitalization episodes – can aid in alleviating some of the disparity seen in ECD care between HIC and LMIC (Britto et al., 2017).

In a resource-constrained setting where healthcare provider provides limited support around developmental monitoring for young children, it is necessary to avail the contact time at hospital in order to best support a child and their parents during a time of great vulnerability. Particularly important is parental knowledge and involvement with stimulation (play and learning) activities, which can have great utility in the LMIC context like Pakistan, where the patient-to-clinician/therapist ratio is very high (1300:1) (Kumar & Bano, 2017) and parent-mediated therapeutic interventions in the region have been shown to hold promise and be effective (Rahman et al., 2016). A community-based parenting intervention study was designed to enhance responsive stimulation (Yousafzai, Rasheed, Rizvi, Armstrong, & Bhutta, 2014), indicating reduced incidence of morbidity in children between birth and 2 years, but the role of caregiving pathways (pertaining to stimulation) on health outcomes was not further examined. Additionally, little is documented about the effects of hospitalization on young children in Pakistan, and to the best of the authors' knowledge, the developmental outcomes of acutely hospitalized children and associated stimulation practices during in-patient hospital admission have not been reported to date from the country.

In a private tertiary hospital in Pakistan, a play-based psychosocial intervention programme for children between birth and 6 years was initiated in 2018 years with the aim to reduce stress for the child and the family (Rasheed, Bharuchi, Mughis, & Hussain, 2021). The study was conducted to further strengthen the case for introducing the intervention programme rationalizing that such interventions can not only reduce stress to improve patient and family experience but can also act as a buffer against the effects of illness on health-related quality of life (developmental outcomes) as indicated in literature from high-income countries. The current study provided an opportunity to address the importance of family practices on developmental outcomes in an in-patient service in the context of a cohort with poor ECD indicators. The objectives were (i) to test the effect of general child health status on early developmental risk in a hospitalized cohort and (ii) to further examine if maternal and paternal stimulation practices independently modified the association.

Methods

Setting

With high under-5 mortality (67/1000), and children constituting 13% of the national population of 220 million – 38% of which have under-5 stunting (UNICEF, 2019), Pakistan is in urgent need of data regarding ECD indicators for young children (0–3 years) such as learning environment at home, parental mental health, parental support, quality of childcare and supervision. The study was conducted in the paediatric service line of a 700-bedded private tertiary care teaching hospital located in the largest and most populated (~28 million people) city of Pakistan serving two provinces. Being an elite urban hospital in the largest city of the country, patients all over the country specifically from the provinces of Sindh and Balochistan visit for a consultation. Affordable quality care can be a constraint in the current healthcare context due to the poor functioning of the public health system, high cost of private centres, and out-of-pocket expenses. The majority of the families pay out of pocket while some are provided fee waivers through a paediatric welfare programme.

The children's ward at the hospital has 120 beds with around 8000 yearly admissions and acute illnesses. Respiratory infections constitute 70% of the admissions in the general ward, with an average length of stay of 3–4 days. The nurse–bed ratio in the low dependency unit is 1:6, and the nurses are not trained to use play therapy with hospitalized children. A play-based intervention delivered by psychology trainees was introduced in 2018. Though the intervention activities included developmentally appropriate activities, developmental screening was not part of the package. A need was felt to add some form of formal developmental risk assessment scores along with the observational notes of the clinical psychologists to the child medical records. The scores could subsequently inform the care plan.

Study design and sample

The current study was a quality improvement (QI) project. The inclusion criteria were children admitted between the age range of 1 month and 6 years, hospital stay of at least 24 h, admission in the general ward, semi-private ward, and/or private ward (October–December 2019). The study was approved as an exemption (being a QI project), and the need for informed consent was waived by the Ethics Research Committee of the Aga Khan University.

Data collection procedures and measures

The data collection was done by two trained research assistants (psychology graduates with experience in evaluation and provision of therapy to children with developmental disabilities) with families in the acute care ward. As part of the data collection process, the research assistants reviewed the list of admitted children in the ward every morning and then approached all eligible families in person (5–6 on average) for feedback. No refusals to participation were reported.

The Survey of Well-Being of Young Children (SWYC), a parent-reported first-level screener for risk of developmental–behavioural concerns in children aged 2 months to 5 ½ years, was used to assess children's development (Perrin, Sheldrick, Visco, & Mattern, 2016). The SWYC has 12 age-specific forms designed to be used as a parent-report measure prior to a visit with the paediatrician. We selected the SWYC because it has been previously utilized for developmental screening of outpatient paediatric patients in Pakistan and indicated acceptability, feasibility and evidence of content validity (Rasheed, Mughis, Elahi, & Hasan, 2021). The following subscales were administered: (i) The SWYC Milestones for developmental risk status, consisting of 10 questions assessing cognitive, motor and language development from 0 to 66 months. Cut-off scores for ages 4–48 months identify whether the child needs review (further assessment); (ii) The Baby Paediatric Symptom Checklist (BPSC) or the Preschool Paediatric Symptom Checklist (PPSC) assessed behavioural and emotional symptoms for children under 18 months of age and those under 18–66 months, respectively. A summed score of 3 or more on any of the 3 subscales on the BPSC or a score of 9 or more on the PPSC indicate that a child is 'at risk' and requires further assessment.

To measure child health status, an item from the Child Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) (Toomey et al., 2015) was used. Parents were asked to report their child's general health (not just the hospitalization episode) on a 5-point scale: excellent, very good, good, fair or poor. One-item indicator of general health functioning has shown to be valid in other studies (Bernhard, Sullivan, Hürny, Coates, & Rudenstam, 2001; Idler & Benyamini, 1997; Locker & Jokovic, 1996).

Maternal and paternal stimulation practices were measured using a key item from the ECD module of the UNICEF Multiple Indicator Cluster Surveys (United Nation's Children's Fund [UNICEF], 2014) (*In the past 3 days, did you or any household member over 15 years of age engage in any of the following (6) activities with your child: read books or looked at pictures together, told* *stories, sang songs, took child outside of the home compound, play with child, named or counted or drew things to or with child?*). Where fathers were not available for interviews, mothers reported the paternal practices. Each of the 6 items (activities) was dichotomously scored as 0 (no) or 1 (yes). The total score was created summing all the items scored positive. A higher score indicates greater engagement. The scale has been previously used in a responsive stimulation intervention study in Pakistan (Yousafzai, Rasheed, Rizvi, Armstrong, & Bhutta, 2015). The reliability estimate (Cronbach's alpha) for the maternal engagement variable was 0.88 and 0.90 for paternal engagement. The Caregiver Knowledge of Child Development Inventory was used to assess maternal knowledge of milestones (Ertem et al., 2007). Cronbach's alpha for the tool was 0.88.

Data analysis

Analysis was completed using Stata version 16.0. Developmental risk was used as a binary variable with a value of 1 indicating risk. Two separate variables were created, one for developmental milestones risk and another for behaviour–emotional risk. The child health status item was reduced from five to two categories to address the issue of small sample size: the categories of 'excellent', 'very good' and 'good' were merged as one, indicating absence of poor health, while 'fair' and 'poor' were merged to indicate poor health status. The dichotomized variable has been used in another study in the same setting (Rasheed, Kedzierski, & Hasan, 2021). Practice variables were created for mothers/fathers separately to indicate if they were involved in more than 3 stimulation activities (at least 50%) in the past 3 days as 'high level of engagement' and 'low level of engagement' if 3 or less than 3. Previous studies have used 4 activities. However, in the study, we chose 3 activities because the sample size for the engaged group would have reduced considerably with 4 as the threshold. Relative risks (RR) were calculated to test the association. We further conducted predefined subgroup analyses to assess whether the level of engagement with stimulation practices modified the effect of child health functioning on developmental risk and behaviour–emotional concerns.

Results

Table 1 summarizes the participants' demographic information and parental knowledge and practices surrounding ECD and child health status. Of the total 231 children assessed, 43% were females and 57% were males; 54% were <1 year of age, 39% between 1 and 3 years, and only 5% between 3 and 5 years of age. Sixty-five percent were admitted for acute issues (e.g. respiratory illnesses, infectious diseases), 20% in general surgery, and the remaining 13% under neonatology, cardiology (pre and post-operative) and neurology disease groups. Interestingly, while maternal education was generally high (50% of mothers had attended university) and maternal knowledge of ECD was mostly adequate (with a mean of 16.6 ± 4.3 on a 20-point scale), this did not necessarily reflect in the maternal practices with their children. A greater number of mothers (27%) were engaged with more than 3 ECD promoting practices daily with their child if had a better health status and lower if their child had poor health status (12%).

Of a total of 231 children assessed, 76 (32.9%) were at risk of delayed developmental milestones of which 34 were also at risk of behavioural–emotional risk. The findings revealed that the risk of being delayed on developmental milestones was 1.95 times (95% CI, 1.36–2.79; $p < 0{\cdot}000$; Table 2) more with poor health status than with better health status. The stratified analysis indicated the association was significant only for parents who reported lower levels of engagement. Parents who utilized less than 3 stimulation practices with their child were 1.9 times more likely (1.89, CI = 1.27–2.81 for mothers; 1.95, CI = 1.35–2.84 for fathers) to have a child at risk of delayed milestones, compared to the children of more engaged parents. There was no significant association between the child's health status and developmental risk of the engaged parents.

On the behaviour–emotional scale, 62 (26.8%) were reported to be at risk, of which 28 were also at risk of developmental delay. The analysis indicated a significant association between child health

Table 1. Descriptive summary of the cohort (N = 231).

Demographic variable	Total N (%)	Child Health Status		p-value
		Poor N = 55	Good N = 176	
Age in months				
0–6 months	67 (29.0)	12(21.8)	55 (31.2)	0.591
7–12 months	60 (25.9)	14 (25.4)	46 (26.1)	
13–24 months	34 (14.7)	11 (20)	23 (13.1)	
25–36 months	58 (25.1)	15 (27.3)	43 (24.4)	
37–60 months	12 (5.1)	3 (5.4)	9 (5.1)	
Gender				
Males	133 (56.6)	34 (61.8)	96 (54.5)	0.343
Females	102 (43.4)	21 (38.2)	80 (45.5)	
Disease group				
Acute care	150 (65.5)	22 (40)	128 (72.7)	0.000
General surgery	47 (20)	15 (27.3)	32 (18.2)	
Cardiology	16 (6.8)	11 (20)	5 (2.8)	
Neurology	8 (3.4)	4 (7.2)	4 (2.3)	
Neonatology	7 (3.0)	2 (3.6)	5 (2.8)	
Length of hospital stay (no. of days)				
Mean (SD)	3.7 (3.8)	4.4 (4.1)	3.6 (3.8)	0.168
Maternal education				
Grade 5 and less	41 (17.9)	17 (30.9)	24 (13.6)	0.001
School	27 (11.5)	12 (21.8)	15 (8.5)	
College	40 (17)	10 (18.2)	30 (17.0)	
University and above	116 (50.8)	14 (26.5)	102 (59.6)	
Maternal knowledge of milestones* (Mean, SD)	16.6 (4.3)	16.6 (3.9)	16.7 (4.2)	0.895
Maternal practices				
<3 activities (N, %)	64 (27.2)	7 (12.7)	56 (32)	0.006
No. of activities (Mean, SD)	1.8 (2.2)	1.2 (1.9)	2.1 (2.2)	
Paternal practices				
<3 activities (N, %)	41 (17.5)	9 (16.1)	32 (18)	0.758
No. of activities (Mean, SD)	1.3 (1.9)	1.1 (1.8)	1.3 (2.1)	

*Maximum score of 20 is possible on the knowledge form.
SD = standard deviation.

Table 2. Effect of child health status on developmental risk in children by maternal and paternal play and stimulation practices.

Outcomes	Child Health Status		Relative Risk (95% CI)	p-value	Risk Difference (95% CI)
	Good	Poor			
DM_Risk-all	46/176 (26%)	28/55 (51%)	1.95 (1.36–2.79)	0.000*	0.25 (0.10–0.39)
Maternal practices >3	13/56 (23%)	3/7 (43%)	1.85 (0.69–4.91)	0.263	0.19 (−0.18–0.58)
Maternal practices ≤3	33/120 (27%)	25/48 (52%)	1.89 (1.27–2.81)	0.002*	0.25 (0.08–0.41)
Paternal practices >3	6/32 (19%)	3/9 (33%)	1.77(0.55–5.74)	0.350	0.15 (−0.19–0.48)
Paternal practices ≤3	40/144 (28%)	25/46 (54%)	1.95 (1.35–2.84)	0.000*	0.27 (0.19–0.43)

*$p < 0.05$.
DM = developmental milestones; denominators are the number of total children in each of the child health status categories.

status and behaviour–emotional risk status (RR = 1.68, 95% CI 1.08–2.58, $p = 0.023$, Table 3). Subgroup analyses by parental practices revealed that social–emotional risk was associated with poor child health status in children of parents who reported high engagement levels: 3.63 times (95%

Table 3. Effect of child health status on behavioural-emotional risk in children by maternal and paternal play and stimulation practices.

Outcomes	Child Health Status		Relative Risk (95% CI)	p-value	Risk Difference (95% CI)
	Good	Poor			
BE_Risk-All	40/176 (23%)	21/55 (38%)	1.68 (1.08–2.58)	0.023*	0.15 (0.01–0.29)
Maternal practices >3	11/56 (20%)	5/7 (71%)	3.63 (1.79–7.37)	0.003*	0.52 (0.17–0.87)
Maternal practices ≤3	29/120 (24%)	16/48 (33%)	1.37 (0.83–2.29)	0.225	.09 (−0.0 6–0.25)
Paternal practices >3	6/32 (19%)	5/9 (55%)	2.96 (1.17–7.49)	0.027*	0.37 (0.12–0.72)
Paternal practices ≤3	34/144 (24%)	16/46 (35%)	1.47 (0.89–2.41)	0.134	−0.11 (−0.04–0.27)

*$p < 0.05$.
BE = behavioural–emotional; denominators are the number of total children in each of the child health category.

CI 1.79–7.37, $p = 0.003$) for mothers and 2.96 times (95% CI 1.17–7.49, $p = 0.027$) for fathers compared to the group with better child health status. However, no statistically significant association existed for less engaged parents, and the effect estimates were lower than for the more engaged parents' group.

Discussion

The aim of the study was to test if there was an association between child health status and developmental functioning across different domains in a hospitalized cohort. We further examined if the association was modified by parental stimulation practices to inform post-discharge care planning. We found a significant association between child health status and their risk of delayed developmental milestones and behaviour–emotional outcomes with the role of parental practices as effect measure modifier present only for the latter as indexed by a change in effect estimates.

The association of poor child health status with the risk of delayed milestones aligns with the existing literature from HICs (Boles et al., 2020). In the current study, it was statistically significant only for the group with fewer parental practices. The role of various diseases and biological pathways explain why a sick child is at risk of delay. An additional risk, particularly in LMICs, is lower levels of engagement with their environment and fewer opportunities to play (Walker et al., 2011). Also, parental focus and priority being the child's physical health especially when the child remains generally sick can be another challenge for parental engagement with play activities. Moreover, childhood illness and frequent hospitalization can cause great stress and distress for the parents influencing their practices with the child which can have an impact on the child's recovery and health outcomes (Kosta et al., 2015; Weiss et al., 2017). These findings imply that families need professional intervention and support which can be initiated during hospitalization and also incorporated as part of post-discharge plan especially for those who have children with poor health functioning.

Regarding behaviour–emotional functioning, the risk of delay with poor health status was significant in children whose parents engaged in more activities compared to those who did not. This was an unexpected finding. One possible explanation can be that when parents tried to engage their children in cognitively demanding play activities, they found it difficult due to sickness of the child resulting in more observed 'impaired' behaviours compared to those who engaged in fewer activities. In fact, an intervention study found that it took at least 20 min for trainee therapists to engage parents with their child in a meaningful interaction owing to irritability of the child (Rasheed et al., 2021). Moreover, measurement of social–emotional skills has been identified as a challenge when completed through parent-report measure especially in a context where parental engagement is low (Finch, Yousafzai, Rasheed, & Obradović, 2018). A more accurate assessment would have been the direct observation of the interactions to ascertain behaviour–emotional concerns. We believe that though the findings were not significant for low-engaging parents and with lower effect estimates, this cohort of parents cannot be ignored. The child has a significant role to play in their own development through exploration of the environment and their ability to engage adults (Gruber & Vonèche, 1977). Children with poor health status may not have the energy to engage parents and are hence at additional risk of suboptimal developmental functioning. This means all parents may need help with behaviour management of a child who is generally not well. Most parents may need advice to start engaging with their child through stimulation activities, and some who are already engaged will need help with management of the child's behaviour and emotions.

An encouraging finding was that paternal stimulation was associated with the child developmental risk similar to the findings reported by another study in Pakistan; that along with maternal, paternal stimulation mediated intervention effects on children's longer-term cognitive and social–emotional outcomes (Jeong et al., 2019). Hospitalization was identified as an opportunity to include fathers for advice regarding stimulation activities. Another interesting observation was that maternal knowledge of developmental milestones was high, but it did not translate to greater practices indicating the need for a coaching support intervention.

There are several limitations of the study. There were no norms of SWYC available for the Pakistani population, though the association was in the expected direction with health status aligning with the literature. Given there are no tools available with norms for the country and SWYC had demonstrated feasibility and acceptability in another study in a similar setting like ours and findings were being used to incorporate recommendations to strengthen an ongoing intervention programme, we felt SWYC was a good parent-report option. However, future studies should also consider examination of psychometric properties of the SWYC. This was not possible in the current study due to a lack of resources and time given no external funds were available. Another limitation was assessing behaviour–emotional development concerns which can be more challenging to measure than the comparatively objective measure of developmental milestones (Finch et al., 2018) as behaviour and emotions can be context specific. Also, the item used to measure stimulation practices on caregiving measures the diversity of activities rather than the quality of interaction which would require direct observation. Additionally, maternal practices and activities with their children were fairly limited, with only 28% of mothers regularly engaging in 3 or more activities with their child. The sample size was another limitation when stratified into subgroups resulting in larger CI especially for behavioural–emotional concerns warranting further studies with a larger sample size. The sample size for child health across subgroups was also fairly low, and dichotomized variable may not be ideal. We also realize that acute care settings can be stressful for parents and families with a sicker child may be more likely to perceive their child to be at risk. Hence, we had envisioned the screening not one time but as a surveillance measure so developmentally is tracked post-admission too. We were also unable to collect information about the socioeconomic status of the families as a covariate. We also realize this would not have been possible if participants were uncomfortable sharing sensitive information as some may have applied a waiver for expenses. However, given the significance of the variable, it is recommended that an effort is made to collect the information in future studies.

Moving forward, we believe the assessment of children's development and family stimulation practices should be a part of the in-patient paediatric assessment. This has relevance not just for ECD but also healthcare. As per the International Consortium for Health Outcome Measurement values for quality healthcare, measurement of outcomes that matter to families and patients should be prioritized (International Consortium for Health Outcomes Measurement, n.d.). This indicates the importance of not only measuring child health outcomes under the biomedical model but also supporting other significant factors such as parenting programmes, therapeutic and relationship-building interventions for children's socioemotional and developmental outcomes in terms of holistic well-being. In resource-constrained settings, this can be improvised by ECD interventions based on the framework of nurturing care which have shown promise in community-based studies (UNICEF et al., 2018) and can be incorporated as part of the care plan.

Implications for practice

In the current study, children with poor health status were reported to be at risk of delayed milestones by parents who engaged in fewer stimulation activities and at risk of behaviour–emotional issues by parents who engaged in greater stimulation activities. Support for parents to engage in stimulation practices with sick children was indicated to be integrated as part of long-term care. Specifically, parents need advice on the significance of play, knowledge about developmentally appropriate activities and coaching to engage a sick child who can be emotionally difficult. With respect to implications for similar settings in LMIC, parents should be trained to address their child's developmental and socioemotional needs through play-based stimulation interventions tailored to child and family strengths using low-cost feasible and sustainable intervention models (Rasheed et al., 2021). Moreover, developmental screening during hospitalization is an opportunity to identify and intervene in children at risk due to chronic conditions or frequent hospitalization episodes for provision of holistic care.

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Disclosure statement

No potential conflict of interest was reported by the author(s).

Notes oncontributors

Muneera A. Rasheed was a former faculty and Director, Patient Expereince of Care at the Aga Khan University Hospital. Trained as a clinical psychologist to work with children with developmental disabilities, her interest lies in utilizing behaviour change interventions to strengthen healthcare systems via innovative macro-level solutions.

Waliyah Mughis is trained in clinical psychology and early childhood development. She teaches foundations of human behaviour and cognitive psychology at the undergraduate level, and is currently involved in several maternal and child health projects as a clinical practitioner, researcher and consultant.

Maira Niaz has a masters in clinical psychology. She has several years of experience in providing therapies to children with developmental disabilities as well as conducting assessment in research projects with a developmental component.

Babar S. Hasan is a consultant paediatric cardiologist and former Service Line Chief of the peadiatric service line at the Aga Khan University Hospital. His research focus is around quality improvement (QI) in complex disease using a 4-prong approach of creating QI collaborative, transforming systems, predictive analytics and quality over the life cycle of health. In line with these interests he serves on steering committee of several congenital heart disease outcome collaboratives. He serves on the editorial board of Heart University and is involved with developing curriculum around delivery of care for pediatric heart diseases.

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