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Impact of a single school-based intervention for COVID-19 on improving mental health among Japanese children

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Abstract
An underlying concern about the COVID-19 pandemic is the decline of children's mental health. The present study is aimed to investigate whether a single school-based intervention, including self-monitoring and psychoeducation for COVID-19, effectively achieved its aim to promote children's mental health. The study was conducted in a junior high school. We assigned the third grade as the intervention group, the second grade as the announcement group, and the first grade as the control group. We hypothesized that the intervention group would experience improved mental health and reduced fear of COVID-19 compared to the announcement and control groups. Interaction effects were observed only for depression, indicating a significant effect in the intervention group. These findings suggest that a single school-based intervention that includes self-monitoring and psychoeducation for COVID-19 can help improve children's mental health. It is suggested that school-based interventions that intend to raise children's awareness of COVID-19 promote their healthy development and adaptation to crises within the school.

Keywords
School, intervention, education, mental health, COVID-19

The World Health Organization (WHO) has declared the coronavirus disease 2019 (COVID-19) as a pandemic. As of 14 December, 2020, there were 70,461,926 cases of COVID-19 worldwide, with 1,599,704 deaths, including children (WHO, 2020). The spread of infections has restricted our behavioral patterns and usual functioning. Moreover, these restrictions have hampered children's school life, depriving them of learning and communication with friends and teachers. Despite situational limitations, teachers have made massive efforts to conduct online lessons and have prepared to reopen schools. Although the number of infected people in Japan decreased and most schools reopened, the fear of infection still demanded the practice of social distancing, using

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personal protective equipment, and avoiding the "three Cs," namely, (1) closed spaces with insufficient ventilation, (2) crowded environments, and (3) conversations in close distances (Prime Minister's Office of Japan, Ministry of Health, Labour and Welfare, 2020).

Although these restrictions helped mitigate the spread of this disease, people continued to experience fear, uncertainty, and physical distress. The infection is an invisible threat that may be likened to chemical, biological, radiological, nuclear, and high-yield explosives and causes various stresses adding to the fear of infection (Shigemura et al., 2020). Reviews have reported that longer quarantine duration, infection fears, frustration, boredom, inadequate supplies, inadequate information, financial loss, and stigma cause negative psychological effects, including post-traumatic stress symptoms, confusion, and anger (Brooks et al., 2020). These stresses cause characteristic responses in children different from that in adults, such as trauma expression in play and restless behavior at school (Roccella, 2020), which vary in their degree of severity. Furthermore, children and adolescents who experience disasters may suffer from greater stress and trauma because they are psychologically, physically, and educationally more vulnerable than adults (Peek, 2008; Roussos et al., 2005). Therefore, it is necessary to educate children under the pandemic to prevent their mental health from deteriorating.

The school system is increasingly being used as a locus to promote prevention efforts for mental health improvement, the underlying assumption being that adopting evidence-based programs will result in positive outcomes (Flaspohler et al., 2012). There is strong evidence that mental health promotion programs in schools lead to positive mental health and educational outcomes (Tennant et al., 2007; Weare & Nind, 2011). School-based interventions are proven to be cost-effective as they deliver preventive health education to numerous students simultaneously (Caulkins et al., 2002; Griffin & Botvin, 2010). These benefits have been estimated to exceed costs in most intervention aspects (Throuvala et al., 2019). Schools need to improve the mental health of children by helping them build resilience and minimize the risk of long-lasting trauma (Capurso et al., 2020). Importantly, psychological care concerning COVID-19 is highly effective for children in a school system (Capurso et al., 2020).

For school-based interventions, it is desirable to provide psychoeducation on infection-related stress. Children may benefit from supportive interventions, such as psychoeducation or cognitive-behavioral techniques designed to promote wellness and enhance coping (Pfefferbaum & North, 2020). Psychoeducation can help individuals understand their own physical and emotional reactions and identify when to seek additional support (Marques et al., 2020). It is an evidence-based approach to enhance children's insight to reduce stigma and worries regarding infection (Halder et al., 2020). Thus, school-based psychoeducation will have a positive impact on children, enabling them to deal effectively with various stresses caused by diseases.

The present study aimed to investigate whether a single school-based intervention effectively achieved its aims of promoting children's mental health and reducing their fear of COVID-19. In this study, depression and trait anxiety were used as indicators of mental health. We hypothesized that the intervention group's depression, trait anxiety, and the fear of COVID-19 would reduce compared to the other groups. Consequently, we sought to find whether including psychoeducation for COVID-19 would be effective, as this program was designed to impart knowledge about the infection and ways to deal with stress.

Methods

Study design

An intervention study focusing on psychoeducation was conducted in one Japanese junior high school in July and August in 2020. The intervention was conducted in the third grade, and a simpler

announcement was made in the second grade. The first grade waited for the control. This study compared the effects of the intervention on these three groups.

Participants

Participants were students from the first to third grades, all from a junior high school in Japan. The first grade consisted of 41 boys and 43 girls aged 12–13 years; the second grade, 52 boys and 40 girls aged 13–14 years; and the third grade, 38 boys and 34 girls aged 14–15 years. Verbal informed consent was obtained from all participants and passive informed consent was obtained from their parents.

Procedure

Participants were divided into three groups for each grade: the first grade was the control group; the second grade, the announcement group; and the third grade, the intervention group. The intervention was performed on July 21, 2020, in a junior high school in Japan. All students completed outcome measures at baseline (Time 1) and endline (Time 2), before and after, nearly a month of summer vacation. At Time 1, on July 17, there were approximately 23,029 people infected and 984 COVID-19–related deaths in Japan; at Time 2, on August 25, there were approximately 63,121 people infected and 1196 COVID-19-related deaths in Japan. The intervention was conducted per class for third-grade students as a lesson in the school curriculum. On the same day, an announcement about COVID-19 was made for the entire second grade at a term-end rally. First-grade students did not receive the intervention at that time. However, after this study, first- and second-grade students received a program equivalent to the intervention.

Intervention

The intervention program for third-grade students consisted of a 50-minute session, delivered as a whole class intervention to limit disrupting the curriculum. The therapist was the first author, a clinical psychologist, who is licensed to administer the psychological assessment and perform cognitive-behavioral therapy in a school.

The intervention consisted of a 15-minute self-monitoring session and a 35-minute psychoeducation session. In the self-monitoring session, the students learned about the effects of stress on mental health and how to identify their thoughts, feelings, physiological responses, and actions under the COVID-19 pandemic. They wrote these psychological responses on a paper and shared them with their classmates in as much detail as possible. During the psychoeducation session, using teaching materials provided by the Japanese Red Cross Society (2020), the students learned about the three different "faces" (sickness, stigma, and fear) of COVID-19 that have adversely affected our lives, as well as how to cope with each of these.

An announcement for the second-grade students informed them that pandemic-related stress affects mental health. This 15-minute announcement was included in the 50-minute lecture on how to spend their summer vacation at school, which the therapist made.

Measures

Depression self-rating scale for children (DSRS-C). The Birleson DSRS-C (Birleson, 1981) was used to assess depressive symptoms. In this study, we used the Japanese version of the DSRS-C, validated by Murata et al. (1996), with sufficient reliability. The DSRS-C consists of 18 items (e.g., "I feel so sad I can hardly stand it") for evaluating depression in children, designed as a self-report

questionnaire about their state during the past week. The items are rated on a 3-point scale ranging from 0 (*never)* to 2 (*always)*; higher scores indicate more depressive symptoms. All items showed high internal consistency at Time 1 ($\alpha = .852$, $\omega = .852$) and Time 2 ($\alpha = .870$, $\omega = .862$). DSRS-C scores <15 were considered within the normal range, while scores $\geqslant 16$ indicated high depression (Murata et al., 1996).

Fear of COVID-19 scale. The Fear of COVID-19 Scale (FCV-19S; Ahorsu et al., 2020) was used to assess the fear of COVID-19 among the students. This study used the Japanese version of FCV-19S (FCV-19S-J), validated by Masuyama et al. (2020), with sufficient reliability. The FCV-19S-J consists of seven items (e.g., "I am most afraid of coronavirus-19"). Participants responded to each item on a 4-point scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). A higher score indicated a greater fear of COVID-19. In this study, the total score of all items was used in the analysis. All items showed high internal consistency at Time 1 ($\alpha = .836$, $\omega = .856$) and Time 2 ($\alpha = .859$, $\omega = .884$). FCV-19S-J scores <16.5 were considered within the normal range, while scores $\geqslant 16.5$ indicated high fear of COVID-19 (Nikopoulou et al., 2020).

The state-trait anxiety inventory for children-trait. STAIC (Spielberger, 1973) was used to assess trait anxiety. In this study, we used the Japanese version of the STAIC, as its validity has previously been verified in children (Soga, 1983). The scale consists of two 20-item scales, the first measuring the current level of anxiety (state) and the other assessing the typical level of anxiety (trait). For this study, the second scale was used. Trait anxiety is defined as an individual's tendency to react in an anxious way, regardless of the situation (Jimeno et al., 2011). The trait anxiety scale (STAIC-T) consists of 20 statements (e.g., "I worry too much"), and the participants responded to the STAIC-T statements using a 3-point rating scale (1 = *hardly ever* to 3 = *often*); higher scores indicated greater trait anxiety. All items showed high internal consistency at Time 1 ($\alpha = .914$, $\omega = .917$) and Time 2 ($\alpha = .916$, $\omega = .919$). The STAIC-T scores <44 for boys or <45 for girls were considered to be within the normal range, while scores $\geqslant 44$ for boys or $\geqslant 45$ for girls indicated high depression (Soga, 1983).

Data analysis

We first studied whether there was any significant baseline difference among the three groups, using a separate analysis of variance (ANOVA) for continuous variables. Next, we compared differences in changes of outcome scores among the three groups, using a three-factor repeated-measures ANOVA (between-subjects factors: groups and gender difference; within-subjects factor: Time 1 vs. Time 2). We also used RCI to measure whether there was a clinically significant change in outcome scores in the three groups from Time 1 to Time 2. The $RCI = \sqrt{2\left(S_E\right)^2} \times 1.96$. The RCI was determined using standard error of measurement $S_E = \sigma_{Time1}\sqrt{1-r}$, where σ_{Time1} is the standard deviation at the outcome score in Time 1 and r is the outcome scales reliability coefficient in this study. For each outcome score, changes between Time 1 and Time 2 were considered reliable at a 95% confidence interval if the difference between scores was greater than the RCI. The software used for the analyses was HAD 16.01 (Shimizu, 2016). Statistical significance was determined at $p < .05$.

Ethical considerations

This study was conducted in cooperation with the Board of Education and the school principal and was approved by the Ethics Committee of Iryo Sosei University (# 20–02). All the procedures

Table 1. Descriptive statistics and correlations at Time 1.

		M	SD	1	2	3	4
1	Grade (1–3)	1.95	0.79	—			
2	Gender (boy = 1)	1.47	0.50	−.034	—		
3	DSRS-C (Time 1)	10.28	6.08	.234**	.014	—	
4	FCV-19S-J (Time 1)	17.72	5.91	−.064	.142*	.054	—
5	STAIC-T (Time 1)	34.03	8.76	.077	.073	.678**	.249**

** $p < .01$, * $p < .05$.

Table 2. Means and standard deviations of variables of three groups of Time 1 and Time 2.

		Intervention (Grade 3)			Announcement (Grade 2)			Controlled (Grade 1)		
		Total (N = 72)	Boys (n = 38)	Girls (n = 34)	Total (N = 92)	Boys (n = 52)	Girls (n = 40)	Total (N = 92)	Boys (n = 41)	Girls (n = 43)
Outcome	Time	M (SD)			M (SD)			M (SD)		
DSRS-C	Time 1	11.59	12.75	10.28	10.92	10.04	12.17	7.94	8.00	7.88
		(5.93)	(5.34)	(7.59)	(6.00)	(5.45)	(6.41)	(5.98)	(4.59)	(4.99)
	Time 2	10.79	11.89	9.56	10.61	9.74	11.86	8.45	9.47	7.48
		(6.06)	(5.60)	(6.90)	(6.13)	(5.68)	(6.63)	(6.11)	(4.65)	(5.52)
FCV-19S	Time 1	16.64	15.97	17.44	18.54	17.75	19.67	17.40	16.63	18.15
		(5.91)	(6.14)	(5.55)	(5.99)	(6.10)	(5.24)	(6.09)	(6.26)	(5.28)
	Time 2	15.51	15.00	16.13	17.80	17.29	18.53	16.34	15.53	17.13
		(6.18)	(5.79)	(5.38)	(6.27)	(7.03)	(5.51)	(6.36)	(6.20)	(6.03)
STAIC-T	Time 1	31.96	33.44	33.90	36.17	33.78	39.31	33.66	33.06	30.95
		(8.75)	(8.50)	(10.35)	(9.39)	(8.91)	(8.02)	(10.02)	(8.12)	(8.18)
	Time 2	31.88	33.62	33.81	36.20	34.09	38.97	33.71	32.86	30.97
		(8.54)	(8.79)	(9.87)	(9.17)	(8.41)	(7.70)	(9.78)	(7.90)	(8.45)

Note. DSRS-C = Birleson depression self-rating scale for children, FCV-19S = fear of COVID-19 scale, STAIC-T = state-trait anxiety inventory for children-trait.

involved in this study were in accordance with the ethical standards of the Declaration of Helsinki (2013). Written informed consent was obtained from the school principal.

Results

Preliminary analysis

Descriptive statistics and correlation coefficients for Time 1 are shown in Table 1. Grades were significantly correlated with height of DSRS-C (r = .234, $p < .001$). Gender was significant correlated with the height of FCV-19S-J (r = .142, $p = .028$).

Table 2 displays the variables' means, standard deviations at Time 1 and Time 2. Two-way ANOVAs (group × gender) for Time 1 DSRS-C showed a significant main effect for group ($F(2,230) = 8.582$, $p < .001$, $\eta^2 = .069$) and a significant group × gender interaction ($F(2,230) = 3.386$, $p = .036$, $\eta^2 = .029$), but no significant main effect for gender ($F(1,230) = 0.068$, $p = .794$, $\eta^2 = .000$). Two-way ANOVAs (group × gender) for Time 1 FCV-19S-J showed a significant main effect for gender ($F(1,234) = 5.176$, $p < .001$, $\eta^2 = .022$) but no significant main effect for group ($F(2,234) = 2.236$, $p = .109$, $\eta^2 = .019$) and no significant group × gender interaction ($F(2,234) = 0.025$, $p = .975$,

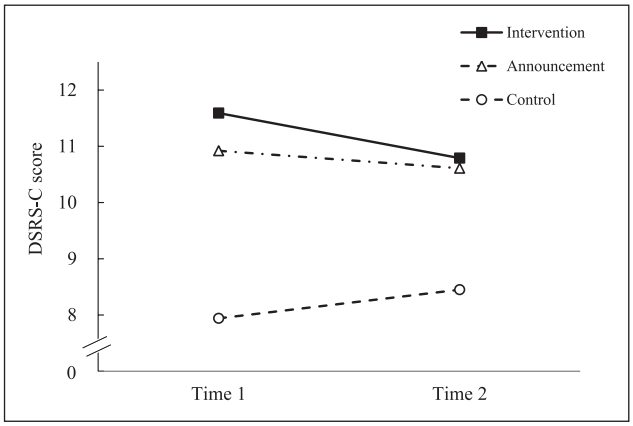

Figure 1. Mean differences in DSRS-C between three groups at Time 1 and Time 2.

η^2 = .000). Two-way ANOVAs (group × gender) for Time 1 STAIC-T showed a significant main effect for group (F (2,229) = 5.131, p = .007, η^2 = .043) and a significant group × gender interaction (F (2,229) = 3.516, p = .031, η^2 = .030), but no significant main effect for gender (F (1,229) = 1.477, p = .226, η^2 = .006).

From the cutoff points of DSRS-C and STAIC-T, the total mean of depression and anxiety characteristics of Time 1 and Time 2 were within the normal range for all groups. However, from the cutoff point of the FCV-19S, Time 1 fear of COVID-19 was high in all groups, but Time 2 fear of COVID-19 was in the normal range in the intervention and control groups.

Main analysis

A repeated-measures ANOVA for DSRS-C indicated a significant main effect of group (F (2,225) = 6.625, p = .002, η^2 = .056), and significant group × time (F (2,225) = 3.356, p = .037, η^2 = .029) and group × gender interactions (F (2,225) = 3.344, p = .037, η^2 = .029). There were no significant main effects of time (F (1,225) = 0.797, p = .373,η^2 = .004) and gender (F (1,225) = 0.363, p = .548, η^2 = .002), while there were significant gender × time (F (1,225) = 1.935, p = .166, η^2 = .009) and group × time × gender interactions (F (2,225) = 2.422, p = .091, η^2 = .021) found. Figure 1 illustrates the changes over time in the DSRS-C among the three groups. The results of multiple comparisons demonstrated that the students in the intervention group showed significantly fewer depressive symptoms between Time 1 and Time 2 (p = .040, d = .136).

A repeated-measures ANOVA for FCV-19S-J indicated a significant main effect of group (F (2,228) = 3.046, p = .049,η^2 = .026), gender (F (1,228) = 3.989, p = .047,η^2 = .017) and time (F (1,228) = 14.305, p = .000,η^2 = .059). However, there were no significant interactions found for gender × time (F (1,228) = 0.356, p = .552, η^2 = .002), group × time (F (2,228) = 0.164, p = .849, η^2 = .001), group × gender (F (2,225) = 0.015, p = .985, η^2 = .000) and group × time × gender (F (2,228) = 0.185, p = .832, η^2 = .002). Figure 2 illustrates the changes over time in FCV-19S-J among the three groups.

A repeated-measures ANOVA for STAIC-T indicated a significant main effect of group (F (2,213) = 6.014, p = .003,η^2 = .053) and a significant group × gender interaction (F (2,213) = 3.804, p = .024, η^2 = .034). However, there were no significant main effects of gender (F (1,213) = 1.103, p = .295, η^2 = .005) and time (F (1,213) = 0.004, p = .947,η^2 = .000). The following interaction effects were also not significant: gender × time (F (1,213) = 0.120, p = .730, η^2 = .001), group × time

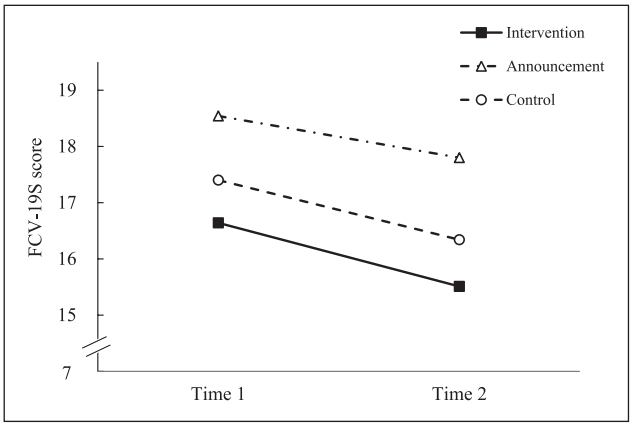

Figure 2. Mean differences in fear of COVID-19 between three groups at Time 1 and Time 2.

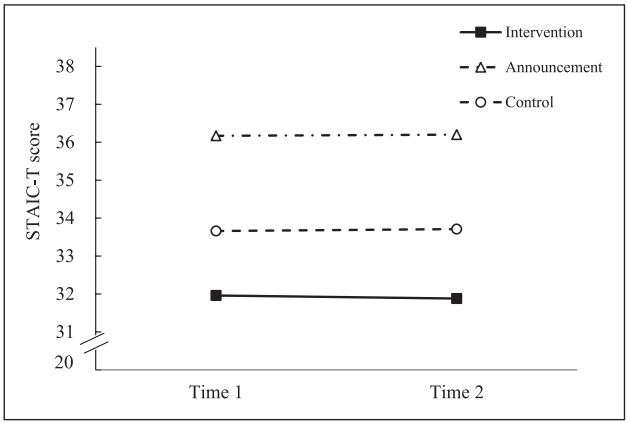

Figure 3. Mean differences in STAIC-T between three groups at Time 1 and Time 2.

(F(2,213) = 0.011, p = .989, η^2 = .000), and group × time × gender (F (2,213) = 0.151, p = .860, η^2 = .001). Figure 3 illustrates the changes over time in STAIC-T among the three groups.

According to the RCI analysis, shown in Table 3, for DSRS-C, 4.41% of the intervention group (n = 3) showed a clinically significant change at the 95% confidence level. For FCV-19S-J, 10.00% of participants (n = 7), and, for STAIC-T, 3.08% of participants (n = 2) displayed a clinically significant change at the 95% confidence level.

Discussion

The present study aimed to investigate whether a single school-based intervention effectively achieved its aims to promote children's mental health and reduce the fear of COVID-19 among Japanese children. We considered that self-monitoring and psychoeducation allowed students to re-examine their mental state and develop the confidence to attend school, based on their newly acquired knowledge of coping with COVID-19. The school-based intervention on COVID-19 is novel, especially in terms of interventions aimed at improving mental health. It was hypothesized that the intervention group's depression, trait anxiety, and the fear of COVID-19 would reduce compared to the announcement and

Table 3. Classification of reliable changes in outcome scores between Time 1 and Time 2.

		Changed		Not changed		Missing	
		n	%	*n*	%	*n*	%
DSRS-C	Controlled	1	1.28	65	91.58	6	7.14
	Announcement	2	2.35	83	90.04	7	7.61
	Intervention	3	4.41	77	90.03	4	5.56
FCV-19S-J	Controlled	7	9.09	58	82.58	7	8.33
	Announcement	7	8.05	80	86.52	5	5.43
	Intervention	7	10.00	75	87.22	2	2.78
STAIC-T	Controlled	6	8.22	55	78.69	11	13.10
	Announcement	7	7.41	74	80.64	11	11.96
	Intervention	2	3.08	75	87.20	7	9.72

Note. DSRS-C = Birleson depression self-rating scale for children, FCV-19S = fear of COVID-19 scale, STAIC-T = state-trait anxiety inventory for children-trait.

control group. The results showed that depression was significantly reduced in the intervention group, but the effect size was small, and few students showed clinically significant changes.

For depression, there was an interaction between time and group, and multiple comparisons showed that only the intervention group showed a significant decrease in depression, although the effect size was small. The effect size of a single intervention for depression is as low in previous studies (e.g., Cardamone-Breen et al., 2018; Ranney et al., 2017) as it is in this study; therefore, many sessions are needed to achieve a higher effect. In addition, the percentage of students in the intervention group who showed a reliable change was small (4.41%). The small effect sizes and reliable changes may be due to the fact that the mean depression values of the sample in this study were in the normal range, and many students in the sample had no mental health problems.

A significant intervention effect on the fear of COVID-19 was not obtained, even though psychoeducation was expected to increase awareness of coping with the stress of COVID-19. Contrarily, all groups showed a significant reduction in fear of COVID-19 after approximately 1 month of summer vacation. Further, based on the cutoff point of the FCV-19S, fear of COVID-19 mean scores was high in all groups for Time 1, but this fear was in the normal range in the intervention and control groups for Time 2. In Japan, there were many restrictions on attending school until May 2020; thereafter, it became possible to go to school as long as the infection prevention measures were observed. It is assumed that, as a result of adapting to fear over time rather than the efficacy of the intervention, the latter had no significant observable effect.

However, the lack of a significant effect on trait anxiety was inconsistent with our hypotheses. This could be because this simple intervention was limited by time constraints to improve trait anxiety. Previous studies on interventions for trait anxiety found that a higher number of sessions showed significant reductions (Muris et al., 2001, 2002; Pedro-Carroll & Cowen, 1985). Therefore, sufficient evidence has shown that significant changes can be obtained by increasing the number of sessions.

This study was conducted in the early stages of a COVID-19 pandemic, and therefore the fear of COVID-19 values at Time 1 were high in all three groups. However, other outcome variables were in the normal range. This suggests that many students may have been mentally healthy despite fearing COVID-19.

Overall, this study showed the effectiveness of implementing psychological interventions against the effects of COVID-19 in schools immediately after the pandemic occurred. The fact that this study is a single intervention may have made the effect size small, but larger effects can be expected with more frequent and longer interventions. Self-monitoring in crisis situations and

providing children with knowledge about the situation may help them survive and maintain their mental health.

Limitations

This study had several limitations. First, the analyses did not control for age or grade level. In this study, the intervention, presentation, and control groups were categorized by grade, which may have confounded the effects of age and grade. Therefore, future research should conduct random sampling, which is useful to devise a measurement so that variables including age do not differ at baseline. Second, we only measured fear as COVID-19–related stress. It is necessary to investigate the effects of interventions on specific stresses, such as refraining from being outdoors and limiting physical distance, to clarify COVID-19–related stress for children. Third, this study examined the effect of a single intervention. Further research is needed to understand how this effect can be strengthened and maintained at follow-up.

Conclusion

The present study aimed to investigate whether a single school-based intervention effectively achieved its aims of promoting children's mental health and reducing their fear of COVID-19. As a result, the intervention had a slight effect on reducing depression, though no effect on trait anxiety and fear of COVID-19. This study suggests that a school-based intervention on COVID-19 improves children's mental health by allowing them the opportunity to re-examine their mental state and develop the confidence to live a regular school life based on their awareness of COVID-19.

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Author contributions

Takahiro Kubo, Akihiro Masuyama, and Hiroki Shinkawa designed the study. Takahiro Kubo and Akihiro Masuyama collected the data. Takahiro Kubo and Hiroki Shinkawa analyzed the data. Takahiro Kubo drafted the report, which was reviewed by all authors. All authors read and approved the final manuscript.

Declaration of conflicting interests

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Appendix

Abbreviations
ANOVA
analysis of variance
COVID-19
coronavirus disease
DSRS-C
depression self-rating scale for children
FCV-19S
fear of COVID-19 scale
STAIC-T
state-trait anxiety inventory for children-trait
WHO
World Health Organization