LETTER TO THE EDITOR

Critical comments on the article "Increased risk of developing psychiatric disorders in children with attention deficit and hyperactivity disorder (ADHD) receiving sensory integration therapy: a population-based cohort study"

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It remains controversial whether clinical interventions for children with attention deficit and hyperactivity disorder (ADHD) increase the risk of subsequent psychiatric disorders [1, 2]. The current clinical intervention guidelines for children with ADHD have been constructed based on evidence-based studies to reduce the risk of adverse outcomes. Thus, readers will have been interested to learn about the effects of sensory integration (SI) intervention on children with ADHD as reported by Tzang et al. [5] in the respective population-based cohort study. Their study elucidated whether applying SI interventions to children with ADHD was associated with subsequent psychiatric disorders. The authors collected Taiwan National Health Insurance claims data from 2000 to 2008 and identified children aged < 8 years who were newly diagnosed with ADHD during 2000–2006 as the target population. Propensity score matching was applied to reduce selection bias and eliminate the possible influence of confounding variables.

However, considering the methodology used in their study, debatable conclusions might have potentially been reported. Our suggestions are as follows:

1. The exclusion criteria.

    The exclusion criteria of the study may have caused underestimation of the psychiatric outcome occurrence risk in the non-SI cohort. According to the exclusion criteria, children with any diagnosis of psychiatric outcomes or hyperkinetic conduct disorder before receiving SI treatment were excluded.

    Therefore, if children in the non-SI cohort demonstrated psychiatric outcomes and then received SI treatment before the inclusion deadline (20061231), they would be excluded from the study population, but such children in the SI cohort were still included; this may have caused underestimation of psychiatric outcome occurrence in the non-SI cohort.

    For example, in Fig. 1, case types A and B were both diagnosed with ADHD in 2000 and demonstrated psychiatric outcomes in 2005. Case type A did not receive SI treatment during 2000–2005 and was included in the non-SI cohort, whereas type B was included in the SI cohort. In this case, they should demonstrate equal psychiatric disorder risk to their group. However, if case type A started SI treatment afterward during 2005–2006, it would have been included in the SI cohort (due to SI treatment index date within the inclusion period) and then be excluded from the study population according to the exclusion criteria (i.e., having psychiatric diagnosis before SI intervention); nevertheless, case type B (also received SI treatment after psychiatric disorder occurred) would still be included. Therefore, the risk was accumulated in the SI cohort; by contrast, some of the risk was lost from the non-SI cohort due to exclusion of later SI treatment applied subjects. The exclusion criteria led to relatively higher risk of psychiatric disorder in the SI cohort.

2. Dosage dependence.

    The hazard and effect levels of SI treatment to subsequent psychiatric disorders remain unclear. However, a stronger effect is expected when the treatment frequencies or total treatment periods increased if an association

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Fig. 1 Possible sub-classification in SI cohort
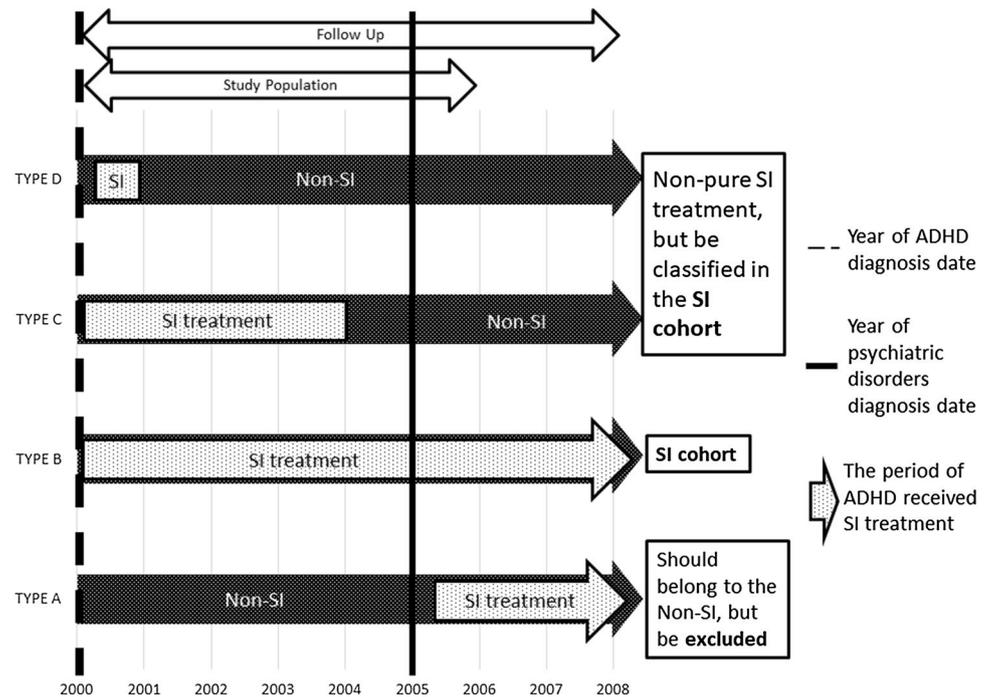
between SI treatment and subsequent psychiatric disorder incidence exists. However, according to the study design, the index date was the only significant factor, which might reduce the accuracy of the results.

As shown in Fig. 1, case types C and D contributed identical incidence values and hazard ratios in the data analysis, but had extremely different SI treatment periods, which does not fit the expectation of dosage dependence; this led to uncertainty toward the correlation between SI intervention and the subsequent psychiatric disorder.

3. Debatable analysis method.

The analysis method used in this study did not consider time-dependent covariates. Based on the study settings, if children were diagnosed with ADHD and had received SI treatment during the inclusion period (2000–2006), they were allocated to the SI cohort without considering the inconsistency of SI treatment exposure. However, from ADHD diagnosis until psychiatric outcome occurrence, the time period with or without SI treatment exposure for each case was potentially different. Consequently, children undergoing different treatment processes were all assigned to the SI cohort and might potentially cause a flawed conclusion. Therefore, lack of considering time-dependent covariates might misattribute all possible risks to the SI cohort. To resolve this, the treatment sessions should be sub-classified using time-dependent covariates in the Cox proportional hazards regression model [3] so as to dis-

criminate the effects of the SI and non-SI periods and obtain rational analysis results.

As shown in Fig. 1, case type D received a short term of SI treatment and then underwent a long non-SI period. It is hard to discriminate whether the subsequent psychiatric disorders were contributed by the SI treatment instead of the non-SI period. However, according to the analysis method, case type D contributed identical hazard ratios as case type B to the SI cohort because of identical index date. This could lead to relatively higher risk of psychiatric disorder in the SI cohort.

In summary, the study might be more precise if the above-mentioned points were considered, including exclusion criteria, dosage dependence, and analysis method. Besides, to our knowledge, Taiwan National Health Insurance claims data are available for up until 2013–2014 [4]; therefore, the reason that the study only presented the follow-up analysis until 2008—even though the authors mentioned that both the cohorts were followed at most until the end of 2013 in the article (page 3, Statistical analyses, lines 4–6)—remains unclear.

The results of this important study, which have raised controversies in the health-care field of Taiwan, may further affect policies or guidelines for clinical interventions involving children with ADHD. Therefore, we recommend adjustments to the methodology of this study to clarify the aforementioned concerns and reach a more comprehensive conclusion.

Compliance with ethical standards

Conflict of interest The author declares that there is no competing interest.

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