**抑郁问卷的异质性：基于对27个抑郁测量问卷的内容分析**

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**Assessing the heterogeneity of 27 scales for measuring depression**

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**CrediT Author Statement**

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摘要

关键词

# 1. 引言

按照总分总方式写主旨句

[第一段的主旨句]

抑郁障碍的严重性（患病率、社会成本等），青少年期和成年早期是关键的时间。

[第二段的主旨句]

自评量表在抑郁症的研究中广泛使用，也是各类关于青少年与学生政策的基础（中国、世界范围内大规范调查的的数据）

[第三段的主旨句]

但抑郁自评量表数量繁多，被广泛使用的量表也不在少数，有潜在的重大影响（如影响到心理健康问题的检出率）。

[第四段的主旨句]

当前研究发现不同抑郁问题可能在测量不同的内容。Fried（2017年）的研究表明，不同的抑郁量表不能互相替代使用，这给抑郁研究带来了挑战。

[第五段的主旨句]

上述问题可能也延伸到发展中国家，但目前没有实证的数据进行评估，本研究将对用于学生的抑郁自评量表进行分析。

还可以补充一些非常广泛的调查，只用了某一个问卷。可以用大规模调查用的问卷来举例。例如中国国民心理健康发展报告，心理所的调查只用了ces-d简版和中国心理健康量表简版广泛焦虑。

# 2. Methods

We took three steps to extract symptoms from all scales that measure depressions among students population (see Fig 1 for the flowchart). Firstly, we identified all scales that has been used for screening depression among students and screen the scales for completedness of their items information. Secondly, we identified unique symptoms of each scale. Thirdly, we compared the symptoms between different scales. The latter two steps followed Fried (2017) but with modifications (see details below).

## 2.1 Identify and screen scales

We identified scales that measure depression from four recent meta-analyses which synthesized the prevalence of different mental health problems among four students populations: elementary school, middle school, high school, and college (于晓琪等, 2022; 黄潇潇等, 2022; 张亚利等, 2022; 陈雨濛等, 2022). We extracted all papers included in these meta-analyses and selected scales that were used for screening depression. In total, we identified 34 scales from 470 articles included in these four meta-analysis.

We then checked versions of each scales and selected the most valid version for each scales in our analysis. The main reason for checking the version of scales is that many scales were translated from foreign languages by different translators. If a scale has multiple versions, we used the following criteria for selecting the version for later analyses: (1), whether or not the version of the scale have been revised, if yes, we usually use the revised version; (2), whether the version of the scale has been validated in at least one Chinese students sample and psychometric indices were reported in the valiation studies; (3), whether symptom names are available for the version of the scale. We also considered the popularity of different versions of a scale when selecting the best version. We finally assess whether there are questions that are difficult to understand or contentious; if so, we refer to other versions for clarification. For instance, CES-D was first translated by 汪向东等(1999), which was used by 39/470 papers. However, 章婕等(2010) revised the 20th item, "I could not get going", of this scale because the meaning of original translation, “我走路很慢” ("I walk very slowly" as directly back translated into English), diverge from the original English item. 章婕等(2010) translated this item as “我提不起劲儿来做事” ("I lack the motivation to do things" as directly back translated into English) and close to the original meaning. Thus we chose the version by 章婕等(2010).

## 2.2 Identify symptoms within scales

In this step, four trained coders coded the symptoms and identified items that assess the identical or similar symptom within each scale. The procedure was as follows: Firstly, four coders independently merged items for each scale. Then, they were grouped into two pairs and each pair discussed their results and resolved discrepancies. Subsequently, two groups of coders cross-check their results and discussed and resolved discrepancies (if there were any) with the corresponding author. The results, a unified version, were indepedently verified by a clinically certificated doctor (co-author \*\*\*) and revised accordingly.

## 2.3 Compare symptoms across different scales

In this step, the same four coders compared symptoms across all scales. The procedure was the same as the identification of symptoms within scales: indepenedent individual coding, discussion by pairs, cross-checking between pairs, discussion with the corresponding author, and verification by a clinically certificated doctor.

The coding processes were as follow. We first pooled symptoms from all scales together and identified unique symptoms. In this step, we retained both compound symptoms and specific symptoms, as in Fried (2017). Compound symptoms are symptoms that include a range of related symptoms, whereas specific symptoms are more concrete and describe specific patterns. For example, “appetite changes” is a compound symptom, it includes two specific symptoms: “appetite increased” and “appetite decreased”. And all three symptoms were treated as unique symptoms. We employed an approach that maximize the amount of different symptoms. More specifically, if the items describe similar symptom using different words and that the words have significantly different meanings under the Chinese context, we treat them as belonging to the same compound symptom but are different specific symptoms. For instance, there are many different words for describe depressed mood in different scales, we used 'depressed moods' as the compound symptom but distinguish different specific symptoms such as: 'blue', 'low mood', 'sad', and 'anhedonia'. This approach is slightly different from Fried (2017), where he coded all these item as a specific symptom 'Sad moods'.

Then, we coded each scale on all unique symptoms. More specifically, a scale was coded as “0” on a symtom if it does not have items that measures this symptom. If a scale has an item that directly measures a symptom, compound or specific, it was coded as 2 on that symptom. Note that if the item measures a specific symptom under a compound symptom, this scale not only had a score of 2 on that specific symptom but also has a score of 1 on the corresponding compound symptom. Similarly, if a scale has an item measures a compound symptom, then, this scale not only had a score of 2 on that compound symptom but also has a score of 1 on each of the specific symptoms under this compound symptom. For instance, the CDI has no item for “Depressed mood”, then we assign a number “0” for CDI on this symptom. And because CDI has an item measures the symptom 'appetite changes', CDI was coded as 2 on the symptom 'appetite changes'. Also, CDI was coded as “1” for all specific symptoms of “appetite changes”, i.e., 'appetite increased' and 'appetite decreased' (see Supplementary Materials and Figure 2 for details).

[insert figure 2 here]

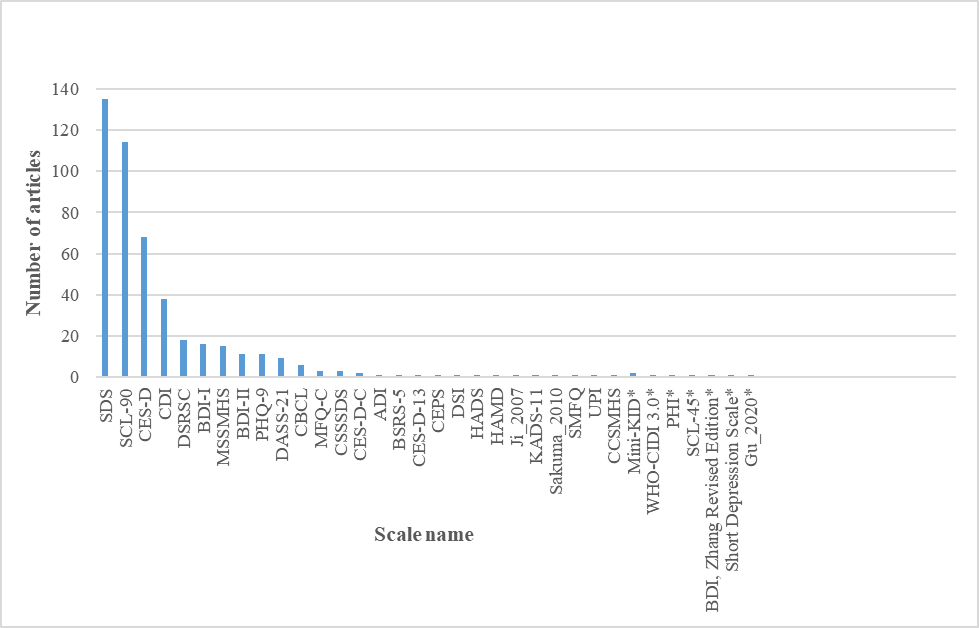
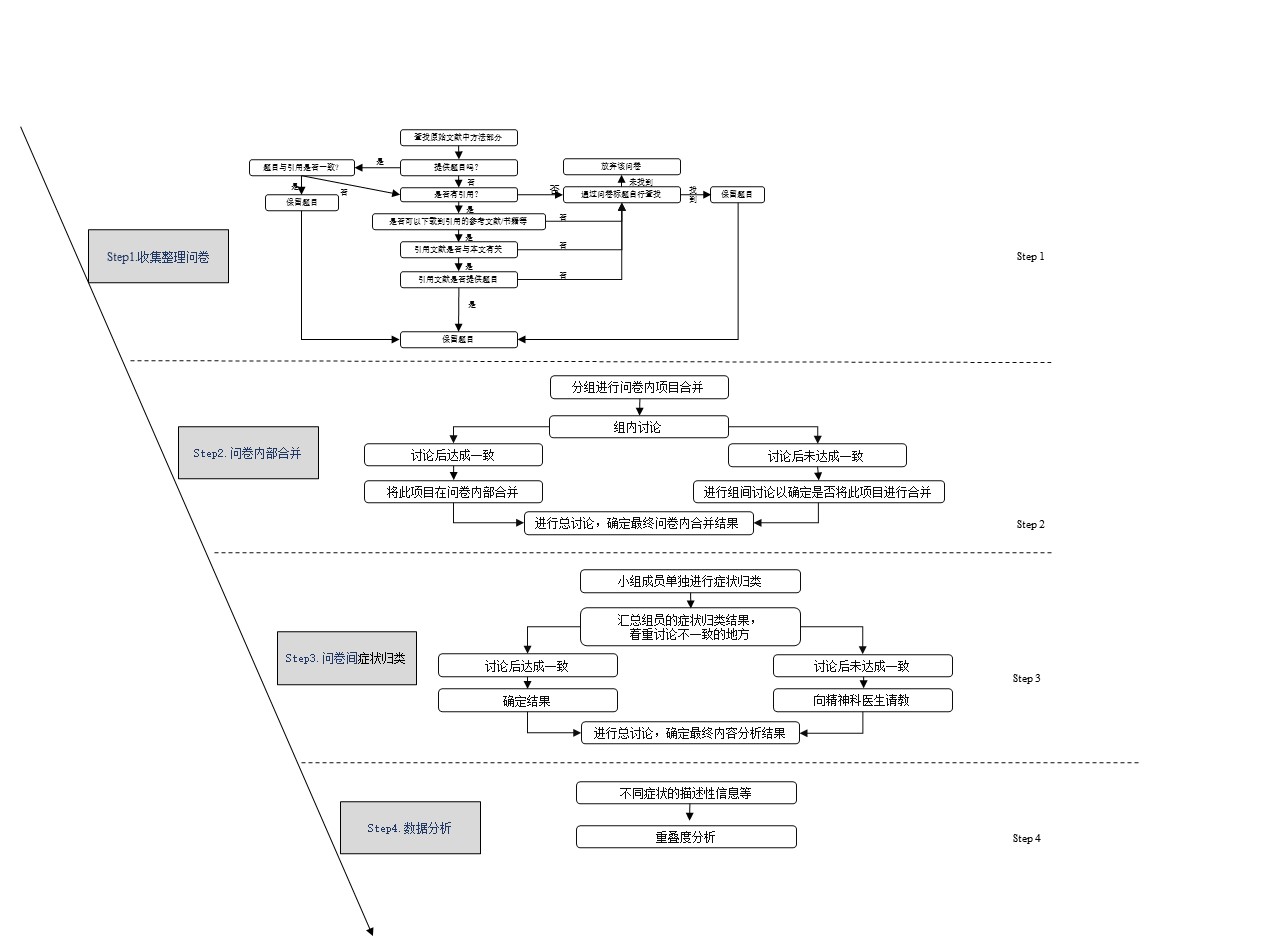


Figure 2. Number of articles that used each scale for screening depression. All these articles were included in four meta-analyses (XXX). Scales with \* were excluded from our analyses.

## 2.4 Data analyses

We reported the following information: descriptive details of different symptoms and the performance and characteristics of scales on various symptoms. Additionally, we provided the proportions of idiosyncratic symptoms (symptoms appeared in only one scale), the respective proportions of compound and specific symptoms, and the proportions of DSM-5 depressive symptoms included.

We used Jaccard index for the degree of overlap between different scales (Fried, 2017). The formal of Jaccard index or Jaccard is s/(u1 + u2 + s), where "s" represents the number of items shared by two scales, and "u1" and "u2" denote the number of items that are exclusively present in each of the two scales. Jaccard index ranges from 0 (no overlap among scales) to 1 (complete overlap). We interpreted Jaccard index as in Fried (2017) guidelines: very weak 0.00–0.19, weak 0.20–0.39, moderate 0.40–0.59, strong 0.60–0.79, and very strong 0.80–1.0.



# 3 Result

# 3.1 A summary of scales

In four meta-analyses, 470 papers were related to depression and 34 unique scales were identified. Among all these scales, the items of four scales, the Mini International Neuropsychiatric Interview for children and adolescents (Mini-KID), WHO-CIDI 3.0, Psychological Health Inventory (PHI), and the Symptom Checklist 45, were not available. The items of the other two scales, the Beck Depression Inventory (Zhang Yuxin Revised Edition) and Short Depression Scale, were not available either because of unidentifiable citations. These six scales were excluded from furthere analyses. The items used in 'Gu & Chen (2020) 'and 'Ji (2007)' were identifical but in different languages, thus we regarded these two studies used the same scale referred them as 'Ji (2007)'. Also, the boys’ and girls’ version of the Child Behavior Checklist (CBCL) were treated as one scale, CBCL. In short, 27 scales were included in the analysis. The number of usages of these scales among all 470 empirical papers in the meta-analytic data is shown in the following graph. The six mostly used scales are SDS, SCL-90, CES-D, CDI, DSRSC, MSSMHS which were different from Fried (2017).

# 3.2 Combined results of items in the scale

For the 27 scales included, there are 425 items in total. When identifying unique symptoms,73 items were merged as 31 symptom after within scale coding. However, there are two cases where one item measured two symptoms. The item from Ji (2007), "During the past 12 months, did you ever feel so sad or hopeless almost every day for two weeks or more in a row that you stopped doing your usual activities?" meausres both 'sad' and 'Sense of hopelessness'. An the 8th item from PHQ-9', "Actions or speech slowed down to a noticeable extent, or conversely—feeling restless or agitated, being unable to sit still, more than usual", measures both 'Agitation' and 'Retardation'. Consequently, a total of 385 symptoms were identified. Table 2 displays the merged results.

Table2 Combined results of items in the scale

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Scale | Number of items before combining | Number of symptoms after combining | Item | Symptoms after combining |
| SDS | 20 | 19 | Q17: I feel like I'm a useful person, and someone needs me. & Q19: I believe that if I were to die, others might be better off. | Worthlessness |
| SCL-90 | 13 | 12 | Q14: Feel your energy levels drop and your activities slow down. & Q71: It's hard to do anything. | Energy loss |
| CES-D | 20 | 17 | Q3: I feel down, even with the help of family and friends. & Q6: I feel down. | Low mood |
|  | 20 | 17 | Q12: I feel happy. & Q16: I have a happy life. | Anhedonia |
|  | 20 | 17 | Q7: I find it hard to do everything. & Q20: I lack the motivation to do things. | Energy loss |
| CDI | 27 | 24 | Q7: Self-hatred. & Q3: Self-depreciation. & Q24: Self-depreciation (compared to peers). | Psychological inferiority |
|  | 27 | 24 | Q15: Learning difficulties & Q23: Underachieve. | Learning difficulties |
| DSRSC | 18 | 16 | Q2: Enjoyed a very sound sleep. & Q14: Have a nightmare. | Poor sleep |
| DSRSC | 18 | 16 | Q10: Life is boring & Q12: Like a variety of things | Interest/ Pleasure loss |
| BDI-I | 21 | 19 | Q2: 0, I'm not pessimistic about the future. 1, I feel pessimistic about the future. 2, I feel like I have nothing to look forward to. 3, I feel that the future is hopeless and nothing can get better. & Q3: 0, I don't look like a loser. 1, I think I fail more often than the average person. 2, When I look back on the past I see many failures. 3, I feel that I am a complete failure. | Sense of hopelessness |
|  | 21 | 19 | Q5: 0, I don't have a strong sense of guilt. 1, I feel guilty about many things I have done or should have done but didn't. 2, I feel guilty most of the time. 3, I feel guilty at any time. & Q8: 0, I don't blame or criticize myself any more than I did in the past. 1, I blame myself more than I used to. 2, Whenever I am at fault, I blame myself. 3, Whenever something bad happens, I blame myself. | Guilty/Self-accusation |
| BDI-II | 21 | 20 | Q5: Guilty & Q8: Self-accusation | Guilty/Self-accusation |
| CBCL\_BOY | 17 | 16 | Q18: Intentionally harming oneself or attempting suicide. & Q91：Expressing the intention to commit suicide. | Suicidal ideation |
| CBCL\_GIRL | 18 | 17 | Q12: Often talk about feeling lonely. & Q111: Lonely and unsociable. | Feeling Lonely |
| MFQ-C | 33 | 26 | Q7: Feeling uneasy. & Q22: Crap happens. | Psychic anxiety |
|  | 33 | 26 | Q6: Slower than usual in activities. & Q13: Speaking slower than usual. | Retardation |
|  | 33 | 26 | Q16: Life is not worth living. & Q17：Thinking about death. & Q19：Thinking of suicide. | Suicidal ideation |
|  | 33 | 26 | Q8: No longer a good person. & Q9: Feeling self-blame for things that aren't my fault. & Q24: Considering oneself a bad person. & Q31: It's wrong to do anything. | Guilty/Self-accusation |
| CSSDS | 20 | 14 | Q2: I have low energy. & Q14: I take everything as a burden. | Energy loss |
|  | 20 | 14 | Q4: I have no interest in studying. & Q8: I find studying dull and uninteresting. & Q12: My grades are dropping. & Q16： I worry about my academic performance. & Q18: I lost the will to study. & Q20: My study efficiency is low. | Learning difficulties |
| CES-D-C | 20 | 16 | Q8: Was not happy & Q9: Felt down and unhappy. Q17: Was happy(R). & Q18: Had a good time. | Anhedonia |
|  | 20 | 16 | Q16: Something good going to happen & Q10: Things did not work out. | Sense of hopelessness |
| ADI | 31 | 29 | Q4: I feel sorry for others. & Q9: Nothing I do is going to make me better. | Guilty/Self-accusation |
|  | 31 | 29 | Q8: I can't pay attention in class. & Q16: I feel like I can't concentrate. | Concentration |
| CES-D-13 | 13 | 10 | Q2: Feel down. & Q4: Feel down. | Low mood |
|  | 13 | 10 | Q9: Feel happy. & Q11: Happy life. | Anhedonia |
|  | 13 | 10 | Q5: Work hard. & Q13: Can't get up. | Energy loss |
| HADS | 7 | 4 | Q4: I can laugh heartily and see the positive side of things. & Q12: I seem to be feeling my emotions gradually declining. | Low mood |
|  | 7 | 4 | Q2: I still have an interest in things I used to be interested in. & Q8: I have lost interest in my appearance (dressing up). & Q14: I can appreciate a good book or a quality radio or television program. | Interest loss |
| SMFQ | 13 | 12 | Q9: Feeling like a bad person. & Q13: Feeling like I've done everything wrong. | Guilty/Self-accusation |
| UPI | 12 | 11 | Q9: Lack of confidence & Q10: Feeling self-abased | Self-abased |

*Note.* Most of the items have been translated from the Chinese version into English, which may result in differences in meaning from the original English version.

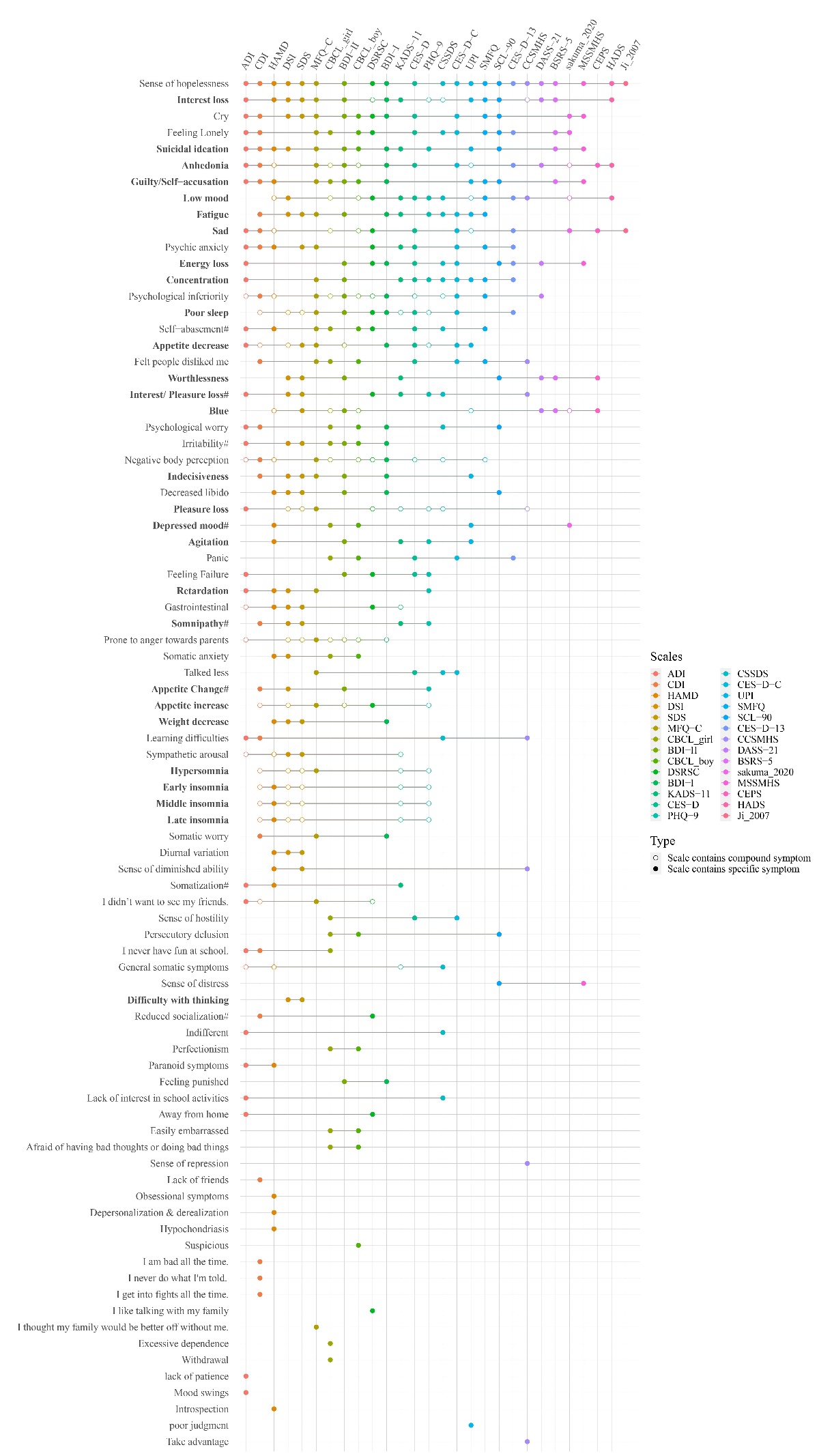
# 3.3 Comparison of symptoms across scales

We then compared 385 symptoms across 27 scales, resulting in unique 84 symptoms (refer to Figure 2). Among these, eight are compound symptoms, including *Depressive mood, Irritability*, *Self-abasement*, *Interest/pleasure loss*, *Somatization*, *Appetite changes*, *Somnipathy*, and *Reduced socialization*. The compound symptoms and the specific symptoms they contain are shown in Table 3.

Table3 Compound symptoms and the specific symptoms they contain

|  |  |
| --- | --- |
| Compound symptoms | Specific symptoms |
| Depressive mood | Blue, Low mood, Sad, Anhedonia |
| Irritability | Prone to anger towards parents |
| Self-abasement | Psychological inferiority, Negative body perception |
| Interest/pleasure loss | Interest loss, Pleasure loss |
| Somatization | Gastrointestinal, Sympathetic arousal, General somatic symptoms |
| Appetite changes | Appetite increase, Appetite decrease |
| Somnipathy | Poor sleep, Hypersomnia, Early insomnia, Middle insomnia, Late insomnia |
| Reduced socialization | I didn’t want to see my friends. |

The most frequently measured symptom, appeared in 22 out of 27, was *Sense of hopelessness*. The second most measured symptom, 18 out of 27, was *Interest loss*. Note that *anhedonia*, a key symptom of major depression, is separated into two symptoms, *loss of interest* and *loss of pleasure*, in DSM-5. We found *Pleasure loss* was observed less frequently than *loss of interest*, being measured in 9 out of 27 scales.



*Depressed mood* is not the most commonly measured symptom across scales because, as mentioned earlier, we retained several symptom descriptions related to depressive mood, including a compound symptom of *depressed mood*, and specific symptoms of *blue*, *low mood*, *sad*,and *anhedonia*. The compound symptom *Depressed mood* was measured by 5 scales, the specific symptom *blue* was measured by 10 scales, *low mood* by 15 scales, *sad* by 13 scales, *anhedonia by 16 scales.* If these symptoms were combined with *depressed mood*, this symptom would be the most frequent symptom among the 25 scales. Table 4 lists in how many scales each of the symptoms are listed; for instance, 11 of the 84 symptoms (13.10%) appear across a subset of 2 scales. Among the 84 symptoms, 18 (21.43%) were idiosyncratic symptoms and only appeared in one scale. None of the symptoms were present on all scales.

Table 4 Number of symptoms that appear across combinations of scales.

|  |  |  |
| --- | --- | --- |
| Symptoms | Scales | % |
| 18 | 1 | 21.43 |
| 11 | 2 | 13.10 |
| 7 | 3 | 8.33 |
| 7 | 4 | 8.33 |
| 7 | 5 | 8.33 |
| 7 | 6 | 8.33 |
| 3 | 7 | 3.57 |
| 4 | 8 | 4.76 |
| 2 | 9 | 2.38 |
| 1 | 10 | 1.19 |
| 5 | 11 | 5.95 |
| 2 | 12 | 2.38 |
| 2 | 13 | 2.38 |
| 3 | 14 | 3.57 |
| 2 | 15 | 2.38 |
| 1 | 16 | 1.19 |
| 1 | 18 | 1.19 |
| 1 | 22 | 1.19 |

*Note.* There are 18 symptoms that appear only in one scale; these symptoms are referred to as idiosyncratic symptoms.

Table 5 provides a comprehensive overview of the symptom count encompassed by each scale, the adjusted scale length, the number of idiosyncratic symptoms and the ratios of compound and specific symptoms. Furthermore, it outlines the prevalence of DSM-5 depressive symptoms within each scale. Among the scales analyzed, 19 did not include any idiosyncratic symptoms. The CSSMHS exhibited the highest percentage of idiosyncratic symptoms, with a prevalence of 22.22%, while the remaining scales showed varying rates of idiosyncratic symptom inclusion, ranging from 3.85% to 12.5%. Ten scales did not incorporate compound symptoms, with proportions for the remaining scales varying from 7.69% to 47.37%. The DSI exhibited the highest prevalence of DSM-5 depression symptoms, encompassing 71.42% of the total nine DSM-5 depression symptoms. Conversely, the Ji\_2005 scale demonstrated the lowest representation, comprising only 3.57% of the nine DSM-5 depression symptoms. It is also the least number of items among the scales included in this study.

Table5 Characteristics of the scales

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Scale | Symptoms  captured  (No.) | Adjusted  scale  length  (No.) | Idiosyncratic  symptoms (%) | Specific  symptoms (%) | Compound  symptoms (%) | Scale captures X% of 9 DSM-5 MDD symptoms |
| SDS | 26 | 19 | 0 | 73.08 | 26.92 | 57.14 |
| SCL-90 | 12 | 12 | 0 | 100 | 0 | 17.86 |
| CES-D | 19 | 17 | 0 | 89.47 | 10.53 | 25 |
| CDI | 32 | 24 | 12.5 | 75 | 25 | 53.57 |
| DSRSC | 21 | 16 | 4.76 | 76.19 | 23.81 | 28.57 |
| BDI-I | 20 | 19 | 0 | 95 | 5 | 35.71 |
| MSSMHS | 6 | 6 | 0 | 100 | 0 | 10.71 |
| BDI-II | 23 | 20 | 0 | 86.96 | 13.04 | 53.57 |
| PHQ-9 | 19 | 10 | 0 | 52.63 | 47.37 | 64.29 |
| DASS-21 | 7 | 7 | 0 | 100 | 0 | 17.85 |
| CBCL\_boy | 23 | 16 | 4.35 | 69.57 | 30.43 | 25 |
| CBCL\_girl | 24 | 17 | 8.33 | 70.83 | 29.17 | 21.43 |
| MFQ-C | 26 | 26 | 3.85 | 100 | 0 | 46.43 |
| CSSDS | 18 | 14 | 0 | 77.78 | 22.22 | 25 |
| CES-D-C | 16 | 16 | 0 | 100 | 0 | 25 |
| ADI | 35 | 29 | 5.71 | 82.86 | 17.14 | 39.29 |
| BSRS-5 | 7 | 7 | 0 | 100 | 0 | 17.86 |
| CES-D-13 | 10 | 10 | 0 | 100 | 0 | 21.43 |
| CEPS | 4 | 4 | 0 | 100 | 0 | 14.29 |
| DSI | 29 | 20 | 0 | 68.97 | 31.03 | 71.42 |
| HADS | 4 | 4 | 0 | 100 | 0 | 10.71 |
| HAMD | 32 | 24 | 12.5 | 75 | 25 | 50 |
| Ji\_2007 | 2 | 2 | 0 | 100 | 0 | 3.57 |
| KADS-11 | 20 | 11 | 0 | 55 | 45 | 53.57 |
| Sakuma\_2010 | 7 | 4 | 0 | 57.14 | 42.86 | 17.86 |
| SMFQ | 13 | 12 | 0 | 92.31 | 7.69 | 17.86 |
| UPI | 15 | 11 | 6.67 | 73.33 | 26.67 | 46.43 |
| CSSMHS | 10 | 8 | 20 | 80 | 20 | 14.29 |

*Note.* Due to the coding method used in this study (refer to section 3.1.3), the scales might capture more symptoms than the number of items, meaning the values in the first column could be higher than those in the second column.

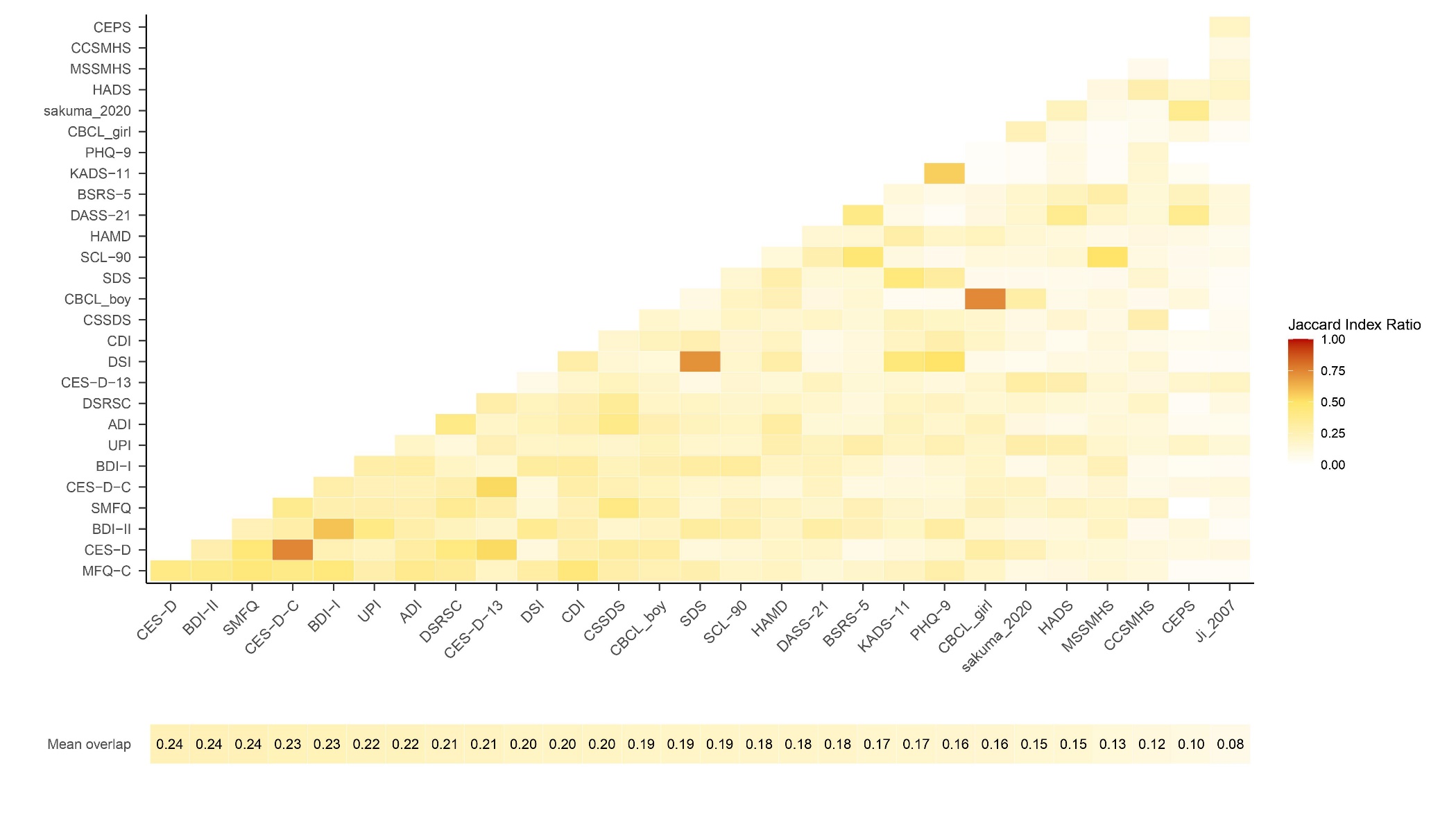
# 3.4 Overlap between scales

The degree of overlap between scales was calculated using the Jaccard coefficient. The average overlap across all scales was 0.19, indicating a very low level of similarity between these scales. For the specific degree of overlap between each pair of scales and the average overlap with other scales, refer to Figure 2.

None of the scales exhibited a mean overlap within the moderate range (0.40 - 0.59) with other scales. CES-D with other scale has the highest average degree of overlap, at 0.25, other scale of average degree of overlap between 0.09 to 0.25. The two scales with the highest overlap were CES-D and CES-D-C at 0.75, followed by DSI and SDS at 0.72.

There are a lot of scales that have zero overlap with each other, that is, they have nothing to do with each other. MSSMHS and CEPS exhibit no overlap; there is no overlap between PHQ-9 and both CEPS and Ji\_2005; CSSDS and CEPS lack overlap; CEPS, SMFQ, and CSSMHS do not overlap; Ji\_2005 and KADS-11 show no overlap.

The correlation coefficient between the mean Jaccard coefficient of each scale and the length of the scale is 0.55, while the correlation coefficient with the number of captured symptoms is 0.71 (Table 4, columns 1 and 2). This suggests that longer scales exhibit increased overlap with other scales, thus demonstrating enhanced representativeness.



# 4 讨论

[第一段的主旨句]

研究分析了多个常用的抑郁量表，并发现它们在捕捉抑郁症状方面存在较大的异质性。这些量表之间的项目内容重叠度较低。这对于使用和解释相关数据有重要的启示作用。

[第二段的主旨句]

Fried (2017).的研究中Ces-d与其他量表有着最差的平均重叠率（0.27），而Ces-d在本研究中表现出最高的平均重叠率（0.25），可能是由于：1、本研究中除Ces-d以外还纳入了Ces-d简版以及Ces-d儿童版。2、在他的研究中Ces-d有33%的独特症状，而本研究中，随着纳入的量表增加，Ces-d的独特症状为0。

[第三段的主旨句]

抑郁量表的异质性来源可能是由于构念的不清晰，因此，在合并来自不同量表的研究结果时（例如元分析），特别是那些几乎没有重叠的量表时，可能不明智。

[第四段的主旨句]

不能认为低重叠就是糟糕的量表，高重叠就是好的量表。选择测量工具时应考虑多种因素，并根据评估的目的和目标进行选择。

[第五段的主旨句]

目前仍普遍认为量表可以互相替代，研究结果表明量表之间异质性非常强。因此在推广结果中应该强调这是某个量表的结果。

[第六段的主旨句]

确定哪些量表是合适的量表非常重要，我们团队正在使用cosmin系统对本次研究中涉及的量表进行评估。

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