The Use of the Severity Dependence Scale (SDS) as an Outcome in Studies of Alcohol and Other Drug Use: A Systematic Review

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ABSTRACT

Introduction: The Severity Dependence Scale (SDS) is a validated measure of the severity of dependence on alcohol or drugs. SDS scores can be used to guide treatment planning, monitor progress, and evaluate treatment outcomes.

Objectives: We aimed to review studies that analysed SDS as an outcome in studies of alcohol and drug use (AoD), with a particular focus on the methodology used to examine the changes in SDS.

Methods: The search was performed using the literature databases Embase, PubMed, and Medline. Articles were included when the outcome was SDS in AoD. Studies that examined SDS, but not among the AoD population, studies that reported SDS as predictors, qualitative research, study protocols, conference papers, and studies in non-English language were excluded.

Results: Among 179 articles identified, 15 were included in the systematic review. Two studies conducted cannabis research, two for methamphetamine, one for cannabis and amphetamine, one for cocaine, one for ketamine, one for ecstasy, and seven for general illicit drugs. Out of 15 studies, ten used the t-test for statistical analysis of the SDS, one used a generalised estimating equation, one used a Spearman non-parametric test, and one used a linear mixed model, one reported the baseline score for the SDS and did not report the SDS at follow-up, one reported a descriptive analysis of the SDS.

Conclusions: In the absence of a standardised cut-off score and a minimal important difference, more attention should be paid in analysing the discrete scale of the SDS to ensure analysis accuracy.

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Introduction

Patient Reported Outcome Measures (PROMs) assess health status and health-related quality of life from the patient perspective. PROMs have gained increased attention in medicine and public health. In alcohol and other drug (AoD) use, Teesson and colleagues suggest outcomes of AoD treatment cover six areas, including (1) Screening for problematic use/quantity/frequency, (2) Diagnosis (dependence/harmful use), (3) Relapse, (4) Functioning, (5) Satisfaction with services and (6) Multidimensional [1].

The Severity Dependence Scale (SDS) was developed in 1995 by Gossop at the National Addiction Centre, Maudsley Hospital, London, UK [2]. The SDS consists of five items to assess the degree of dependence of using alcohol and drugs including: (1) Did you think your use of [named drug] was out of control?; (2) Did the prospect of missing a fix (or dose) or not chasing make you anxious or worried?; (3) Did you worry about your use of [named drug]?; (4) Did you wish you could stop?; (5) How difficult would you find it to stop or go without [named drug]?. Each item is measured on a 4-point scale, scoring from 0 to 3, including (1) Never/Almost never (scoring 0), (2) Sometimes (scoring 1), (3) Often (scoring 2), and (4) Always/Nearly always (scoring 3) [2]. The total SDS score can be determined by adding the points of all five items, with higher scores suggesting greater severity of dependence on using the identified substance [2]. The SDS is a methodologically reliable indicator for healthcare professionals worldwide to identify alcohol and drug dependence [3-6]. It also allows the degree of dependence for designing early and tailored interventions to minimise disorder progression [3]. The SDS could be used as a measurement of the severity of dependence in the absence of standardised research interviews [4].

The SDS has been validated for alcohol cannabis benzodiazepines opioids (codeine, heroin) khat cocaine and amphetamines [5-12]. The cut-off score for the SDS varies for different substances. For example, a cut-off of 3 has been defined for alcohol and ecstasy and 4 for amphetamines [13-14] [12]. For cannabis, the cut-off score could be 2 4 or 3 and 5 [15] [9,16,17]. For cocaine, the cut-off score could be 3 or 4 [18]. For benzodiazepines, it could be 3 or 7 [19,4]. For heroin, it could be 3 or 5 [18,20].

As a self-reported scale, the SDS has advantages – it is inexpensive, easy to interpret and quick and efficient [21,22]. In AoD, self-reports have been widely proven to be sufficiently reliable and
valid to provide descriptions of drug use, drug-related problems, and the natural history of drug use [23-28]. The SDS also has sufficient content, construct and criterion (for validity), has adequate item and test-retest (for reliability), and is a sensitive measurement (for sensitivity) [1] (Table S1). Given the high sensitivity of the SDS to diagnose AoD dependence the scale has been used for routine monitoring and screening of substance use, or as a variable to examine the correlation with other measures [3,4,6,11,15,4].

Table S1: Validation Studies for Severity of Dependence Scale

<table>
<thead>
<tr>
<th>First Author</th>
<th>Cronbach’s Alpha</th>
<th>Drugs</th>
<th>Population</th>
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</thead>
<tbody>
<tr>
<td>Bastiani, L</td>
<td>74%</td>
<td>Cannabis</td>
<td>Italian adolescents aged 15–19 who reported cannabis last year use.</td>
</tr>
<tr>
<td>Cuevas, C</td>
<td>81.3%</td>
<td>Benzodiazepine</td>
<td>Regular benzodiazepine users in Spain.</td>
</tr>
<tr>
<td>Deluca, P</td>
<td>92%</td>
<td>Codeine</td>
<td>Respondents (66% women) who had used codeine containing medicines in the last 3 months and were living in the UK.</td>
</tr>
<tr>
<td>Gu, J</td>
<td>78%</td>
<td>Heroin</td>
<td>Chinese heroin users.</td>
</tr>
<tr>
<td>Hides, L</td>
<td>81%</td>
<td>Cannabis</td>
<td>Participants in Australia, who were cannabis dependent in the past 12 months.</td>
</tr>
<tr>
<td>Kassim, S</td>
<td>76%</td>
<td>Khat</td>
<td>UK-resident adult Yemeni male khat chewers, aged 18 years and above.</td>
</tr>
<tr>
<td>Kaye, S</td>
<td>86%</td>
<td>Cocaine</td>
<td>Cocaine users in Sydney, Australia.</td>
</tr>
<tr>
<td>Manzar, D</td>
<td>58%</td>
<td>Khat</td>
<td>Polysubstance users with khat chewing habit in Mizan, Ethiopia.</td>
</tr>
<tr>
<td>Martin, G</td>
<td>83%</td>
<td>Cannabis</td>
<td>Community sample of 14–18-year-old adolescent cannabis users in Australia.</td>
</tr>
<tr>
<td>Steiner, S</td>
<td>79.6%</td>
<td>Cannabis</td>
<td>Sample of 18-to 64-year-old cannabis users in Germany.</td>
</tr>
<tr>
<td>Ferri, P</td>
<td>83% (powder cocaine), 73% (crack cocaine), 78% (cannabis), 85% (alcohol)</td>
<td>Alcohol, cocaine (snorted), crack cocaine (smoked), cannabis and alcohol</td>
<td>Brazilian drug users.</td>
</tr>
<tr>
<td>Gossop, M</td>
<td>94%</td>
<td>Alcohol</td>
<td>People seeking treatment for drug misuse problems, who were current (last 90 days) drinkers.</td>
</tr>
</tbody>
</table>

The SDS is also considered as one of the routine Client Outcome Measures (COMS) to be collected [29]. It is, however, unclear how the SDS has been analysed. We aim to review literature which analysed the SDS as an outcome in studies of alcohol and drug use, with a particular focus on methodology used to examine the changes in the SDS.

Methods
Prospero Registration
This study is registered with PROSPERO under the number CRD42022169669.

Search Strategy
We reviewed studies that used the SDS as a study outcome among people with AoD dependence. The search was performed using the literature databases Embase, PubMed and Medline as those three databases were the most relevant to the research topic. Searches of each database were conducted using the search terms included in Table 1. The literature search was performed between the 10th of December 2022 and the 28th of February 2023.
Table 1: Database and Search Terms

<table>
<thead>
<tr>
<th>Database</th>
<th>Search strategy and Mesh terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embase</td>
<td>(The Severity of Dependence Scale) OR (SDS) AND (Alcohol) OR (Drug)</td>
</tr>
<tr>
<td>PubMed</td>
<td>(The Severity of Dependence Scale) OR (SDS) AND (Alcohol) OR (Drug)</td>
</tr>
<tr>
<td>Medline</td>
<td>(The Severity of Dependence Scale) OR (SDS) AND (Alcohol) OR (Drug)</td>
</tr>
</tbody>
</table>

Eligibility Criteria and Screening

Articles were included when the outcome (primary or secondary) was the SDS in AoD. Studies that examined the SDS, but not among the AoD using population were excluded. Studies that reported the SDS as a predictor were excluded. Qualitative research, study protocols and conference papers were excluded. Articles were also excluded if the primary language of the article was not English.

Screening of the retrieved documents was carried out in two stages: screening of the titles and abstracts for inclusion of all relevant studies and assessment of the full texts for eligibility criteria. Two different reviewers (KJ and ADT) conducted both stages independently, and inconsistencies were resolved by a third reviewer (EG).

Screened articles were entered into an Excel spreadsheet for further full text screening and analysis. The Excel spreadsheet was used to classify each article by first author of article, year of publication, country, study design, intervention or treatment, sample size, characteristics of population, follow-up time, method, and main outcome of study, the SDS reported (mean and SD) and conclusion. In the methods and conclusion sections, only content related to drug dependence and conclusions were reported.

Results

Literature Search Results

Figure 1 depicts the PRISMA diagram of the literature search. After using the relevant MeSH terminology in three databases (Table 1), 179 articles were identified. Four articles were removed due to duplication, and 175 articles remained for the initial screening with titles and abstracts, 54 articles were determined as irrelevant to the research topic and 121 articles were eligible for the full-text assessment. After conducting full-text screening, 106 articles were removed because the articles did not meet the inclusion criteria. Of the 106 articles excluded at this stage, 100 did not consider the SDS as an outcome. Three non-English studies and three conference papers were also excluded. Finally, 15 articles were included in the systematic review.
Characteristics of the Literature
Among the 15 eligible articles for the systematic review, 14 studies were published after 2004, demonstrating recent valid results [30-43]. Five articles were from Australia, four articles from Europe and six articles from Asia [30-44].

Seven articles conducted randomised controlled trials; two were cross-sectional studies; two were cohort studies; one was an observational study; one was a prospective study; one was a retrospective study; and one was a longitudinal study [30-44]. Eleven studies were about non-pharmacotherapy interventions and four articles were about pharmacotherapy approaches for substance use disorder [30-44].

Substance of Interest
Two studies conducted cannabis research; two studies for methamphetamine; one study for cannabis and amphetamine; one study for cocaine; one study for ketamine; one study for ecstasy; and seven studies for general illicit drugs [30-44].

Methodology Used to Investigate SDS
Ten studies used the t-test for statistical analysis of the SDS, one study used a generalised estimating equation, one study used a Spearman non-parametric test, and one study used a linear mixed model. One study only reported the baseline score for the SDS and did not report the SDS at follow-up. One study only reported a descriptive analysis of the SDS [30-44].

Association of AoD Treatment and Improved SDS
Ten studies concluded that SDS improved, and five studies concluded that SDS did not improve. Among the 10 studies that showed the improvement in SDS, nine were residential rehabilitation interventions or therapeutic approaches and one involved a pharmacotherapy. Five studies did not demonstrate improvements in SDS with regard to detoxification and pharmacotherapy [30-44].

Discussion
The SDS has been validated and recognised as an acceptable and feasible measure of the severity of substance dependence [6,11,45]. The SDS has high diagnostic utility with high specificity and sensitivity [6,11,45]. However, most studies only reported the SDS as descriptive data and/or a predictor. These may be attributed to SDS being self-reported. Using self-reported data as a study outcome remains controversial. While self-reported data in AoD have proven reliable, doubts about response bias among researchers persist [22,24,46,47]. A disadvantage of SDS is that it does not include signs of physical dependence, such as tolerance and withdrawal caused by neuroadaptation, which may limit its use as a study outcome [2].

There is a lack of standardisation in the SDS cut-off score. If the SDS is used to describe data, the cut-off score is not as important as if it is used as a study outcome. Because of the latter, an intervention could be regarded as “improved” with the chosen cut-off but could be “no improvement” if a different cut-off score was used. There have also been no cut-off scores determined for newly emergent substances, which dramatically decreases the standardisation of the SDS [34].

In the absence of a standardised cut-off score, most of the studies in our review examined SDS as a continuous variable. We found that most studies conduct the t-test without checking the normal distribution assumption of the SDS [30,32,34,41-44,48]. To assist researchers in interpreting and reporting on the SDS, the minimal important difference (MID) needs to be reported. The minimal important difference is the difference that corresponds with a change that is regarded as valuable to respondents and significant by researchers and clinicians [49]. However, we found no study reporting the MID for SDS.

Strengths and Limitations
A major strength of our study is that we conducted a rigorous systematic review. We reviewed the application of the SDS in the published literature as a study outcome. A limitation of our systematic review is that we did not conduct the reporting quality assessment. Studies included in the systematic review have different designs, including randomised control trials, cross-sectional, case-control, cohort, retrospective, prospective and longitudinal studies, which require different checklists. Secondly, we did not examine if the study interventions were associated with the improvement in the SDS, e.g., pharmacotherapy or therapeutic approach; this requires an intensive examination of the statistical analysis (bias, confounding) and study design (sample size), which was not the aim of our study. Thirdly, we excluded pharmaceutical opioids in other populations, such as those with cancer or those who were pregnant, because we wanted to focus on alcohol and illicit drugs only.
Table 2: Characteristics of Studies Used SDS as a Study Outcome

<table>
<thead>
<tr>
<th>First Author and Year of Publication</th>
<th>Country</th>
<th>Study design</th>
<th>Intervention/ Treatment</th>
<th>Follow up time</th>
<th>Sample size</th>
<th>Population</th>
<th>Main outcome/Method</th>
<th>Mean SDS at baseline</th>
<th>Mean difference after intervention/ exposure group</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ahmednejad et al. 2019.</td>
<td>Iran</td>
<td>Randomised controlled trial</td>
<td>Brief cognitive behavioral therapy</td>
<td>4 and 12 weeks follow up</td>
<td>120</td>
<td>Regular methamphetamine use among methadone-maintained women</td>
<td>Main outcome: frequency of methamphetamine use, severity of methamphetamine dependence, number of days of methamphetamine use, motivation to change, psychological well-being, social functioning. Method: Independence sample t-test was used to examine the association between the SDS and the CBT.</td>
<td>Treatment group: 9.9 (2.2)</td>
<td>Control group: 9.9 (2.52)</td>
<td>Treatment group: 3.8 (2.09) Control group: 9.8 (2.39) 12 weeks: Treatment group: 3.7 (2.15) Control group: 9.9 (2.65)</td>
</tr>
<tr>
<td>Athers et al 2022.</td>
<td>Switzerland, Austria, Germany</td>
<td>Randomised controlled trial subgroup analysis</td>
<td>CANreduce 2.0 Self-guided web-based intervention (6 weeks duration) consists of modules grounded in motivational interviewing and cognitive behaviour therapy</td>
<td>3 months follow up</td>
<td>367</td>
<td>Cannabis-use in adults who screen positive for attention deficit/hyperactivity disorder</td>
<td>Number of days cannabis was used in the preceding 30 days, the cannabis use disorder identification test score (CUDIT) and the SDS at baseline and the 3-months follow-up. Method: SDS with a score &gt;4 indicating cannabis dependence.</td>
<td>With attention deficit/hyperactivity disorder: 9.1 (3.0) Without attention deficit/hyperactivity disorder: 7.1 (3.1)</td>
<td>With attention deficit/hyperactivity disorder: 5.55 (2.86) Without attention deficit/hyperactivity disorder: 4.63 (3.02)</td>
<td>Both adults with and without positive attention-deficit/hyperactivity disorder screening reported significantly reduced in SDS with CANreduce 2.0.</td>
</tr>
<tr>
<td>Alharbi et al 2022.</td>
<td>Saudi Arabia</td>
<td>Cross-sectional study</td>
<td>Detoxification</td>
<td>21 days of treatments</td>
<td>90</td>
<td>Group I: control group Group II: amphetamine users Group III: amphetamine plus cannabis users</td>
<td>Amphetamine user group: 10.86 (2.47) Amphetamine and cannabis user group: 10.06 (2.30)</td>
<td>Not reported</td>
<td>Not clear if the SDS was improved after detoxification.</td>
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<tr>
<td>Alammehrjerdi et al. 2019.</td>
<td>Iran</td>
<td>Randomised controlled trial</td>
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<tr>
<td>Cruickshank et al 2008.</td>
<td>Australia</td>
<td>Randomised controlled trial</td>
<td>Placebo versus Mirtazapine</td>
<td>Measures recorded on days 0, 3, 7, 14</td>
<td>31</td>
<td>Methamphetamine users</td>
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<td>Day 0: Mirtazapine: 11.3 (0.9) Placebo: 11.2 (0.6) Total: 11.2 (0.5) Day 7: Mirtazapine: 8.2 (1.2) Placebo: 10.2 (0.9) Total: 9.3 (0.8) Day 14: Mirtazapine: 8.3 (1.6) Placebo: 8.0 (1.2) Total: 8.1 (1.0)</td>
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<tr>
<td>Day 0: Mirtazapine: 11.3 (0.9) Placebo: 11.2 (0.6) Total: 11.2 (0.5) Day 7: Mirtazapine: 8.2 (1.2) Placebo: 10.2 (0.9) Total: 9.3 (0.8) Day 14: Mirtazapine: 8.3 (1.6) Placebo: 8.0 (1.2) Total: 8.1 (1.0)</td>
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<tr>
<td>Garvey et al 2021. United Kingdom</td>
<td>Cohort study</td>
<td>Breaking Free Online computer-assisted therapy (BFO) and Pilars of Recovery intensive group therapy (PoR)</td>
<td>Follow-up time varied due to various factors such as attrition, moving prisons, or being released from prison</td>
<td>466</td>
<td>Individuals who used illicit substances within the criminal justice system</td>
<td></td>
<td></td>
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<tr>
<td>Jonas et al 2018. Germany</td>
<td>Randomised Factorial Trial</td>
<td>Factor 1: real-time counselling via chat-Chat: Yes vs No Factor 2: intervention duration: 50 days vs 28 days</td>
<td>3, 6 and 12 months follow up</td>
<td>135</td>
<td>Cannabis-users</td>
<td></td>
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<tr>
<td>Factor 1: Chat-based communication No: 9.9 (2.8) Yes: 10.0 (2.7) Factor 2: Treatment length 28 days: 10.1 (2.5) 50 days: 9.8 (2.9) 3 months Factor 1: Chat-based communication No: 5.4 (3.4) Yes: 5.1 (3.3) Factor 2: Treatment Length 28 days: 5.4 (3.6) 50 days: 5.1 (3.7) 6 months Factor 1: Chat-based communication No: 5.4 (3.4) Yes: 5.1 (3.3) Factor 2: Treatment Length 28 days: 5.4 (3.6) 50 days: 5.1 (3.7) 12 months Factor 1: Chat-based communication No: 5.4 (3.4) Yes: 5.1 (3.3) Factor 2: Treatment Length 28 days: 5.4 (3.6) 50 days: 5.2 (3.8)</td>
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<tr>
<td>Authors</td>
<td>Year</td>
<td>Country</td>
<td>Study Design</td>
<td>Intervention</td>
<td>Follow-up</td>
<td>Sample Size</td>
<td>Outcomes</td>
<td>Method</td>
<td>Results</td>
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<tr>
<td>Kapoor et al. 2019</td>
<td>India</td>
<td>Observational study</td>
<td>Methadone treatment</td>
<td>8 weeks follow-up</td>
<td>72</td>
<td>Individuals with drug addictive behaviour</td>
<td>Main outcomes: SDS, Drug and alcohol use, WHO quality of life, BQOM-C items on arrears, BQOM-C items on risky drug use, Substance use recovery evaluator, Client service receipt inventory.</td>
<td>Method: Paired sample t-test</td>
<td>Not reported</td>
<td></td>
</tr>
<tr>
<td>Kelly et al. 2021</td>
<td>Australia</td>
<td>Non-randomised, prospective, single-arm trial</td>
<td>Mobile health app for routine outcome monitoring and feedback in SMART recovery mutual support groups</td>
<td>6 weeks, 12 weeks, 6 months, and 12 months follow-up</td>
<td>202</td>
<td>Young individuals in residential substance use disorder treatment receiving group dialectical behaviour therapy</td>
<td>Main outcomes: Global psychiatric symptoms, SDS, Brief Situational Confidence Questionnaire, World Health Organisation Quality of Life-8, Group session rating scale, Treatment integrity checklist</td>
<td>Method: Linear mixed model was used to examine the effect of the intervention</td>
<td>SDS scores improved over time for young people in residential substance use disorder treatment receiving dialectical behaviour therapy</td>
<td></td>
</tr>
<tr>
<td>Marceau et al. 2021</td>
<td>Australia</td>
<td>Cohort study</td>
<td>Dialectical behaviour therapy</td>
<td>3 months follow-up</td>
<td>50</td>
<td>Individuals used ecstasy at least once in the past month</td>
<td>Main outcome: percentage abstinence for 90 days, days of ecstasy use in the 90 days, mean pills used, dependence symptoms, SDS score.</td>
<td>Method: T-test was used to examine the association between SDS and intervention for the groups at follow-up</td>
<td>SDS scores improved over time for young people in residential substance use disorder treatment receiving dialectical behaviour therapy</td>
<td></td>
</tr>
<tr>
<td>Martin et al. 2010</td>
<td>Australia</td>
<td>Randomised controlled trial</td>
<td>Single motivational and cognitive behavioural intervention</td>
<td>5 months follow-up</td>
<td>50</td>
<td>Individuals used ecstasy at least once in the past month</td>
<td>Main outcome: percentage abstinence for 90 days, days of ecstasy use in the 90 days, mean pills used, dependence symptoms, SDS score.</td>
<td>Method: T-test was used to examine the association between SDS and intervention for the groups at follow-up</td>
<td>SDS did not improve with single motivational and cognitive behavioural intervention.</td>
<td></td>
</tr>
</tbody>
</table>
### Conclusion

In the absence of a standardized cut-off score and a minimal important difference (MID), more attention should be paid in analysing the discrete scale of the SDS to ensure analysis accuracy.

### Author Contribution

KJ: searched literature, wrote the manuscript; EG: searched literature, wrote part of the manuscript; ADT: designed the aims, method, searched literature, wrote the manuscript, supervised the team.

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psychoactive drugs 51: 280-289.


