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ORIGINAL PAPER

Efficacy of 12-step mutual-help groups other than Alcoholics Anonymous: a systematic review and meta-analysis

Martin Leurent[1] · Déborah Ducasse[1] · Philippe Courtet[1] · Emilie Olié[1]

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Abstract

This paper offers a systematic review of quantitative and qualitative studies on the main twelve-step mutual-help (TSMH) groups (excluding Alcoholics Anonymous) and four meta-analyses exploring the correlation between (i) duration or involvement in TSMH groups and; (ii) severity of symptoms or quality of life. Systematic review was conducted following PRISMA guidelines. Searches of databases (MEDLINE, PsychInfo), a register (ClinicalTrials) and citations were conducted, from inception through November 01 2022. Fifty five articles were included (24 quantitative, 27 qualitative, 4 mixed-methods), corresponding to 47 distinctive studies. 68% of these studies were conducted in North America, 17% in Middle East, 11% in the European Union and 4% in Australia. The most studied TSMH group were Gamblers Anonymous (28% of the 47 studies), Narcotics Anonymous (26%), Double Trouble in Recovery (15%), Overeaters Anonymous (19%) and TSMH groups for compulsive sexual behaviors (11%). The four meta-analyses pooled data from 9 studies. Pooled mean age ranged from 36.5 to 40.5. 80–81% of participants were male. TSMH attendance and involvement were negatively correlated with severity of symptoms (high and medium levels of evidence) and positively correlated with quality of life (low levels of evidence). Twenty-one qualitative papers reported factors influencing recovery: Social ($n=15$), emotional ($n=9$), spiritual ($n=8$), self-identification or psychological ($n=6$) factors. Review provides characteristics of TSMH groups others than Alcoholics Anonymous, with implications for both research and healthcare practice. The perspective to implement TSMH groups targeting ontological addiction, at the root of all addiction, is discussed.
Protocol registration: Prospero registration number: CRD42022342605.

Keywords Addictive behaviors · Self-help group · Twelve-step program · Severity of symptoms · Quality of life

Introduction

Several systematic reviews have demonstrated that social isolation (the lack of social contacts and having few people to interact with regularly) is associated with depressive symptoms [1, 2], which, in turn, are correlated with unhealthy behaviors and reduced access to material resources [3]. Loneliness (the distressing feeling of being alone or separated) can lead to mental illness such as depression, alcohol abuse, sleep problems, Alzheimer's disease, and to physical disorders like diabetes, autoimmune disorders and cardiovascular diseases, physiological aging, cancer, poor hearing and poor health [4]. This is even more problematic for individuals with addictive disorders, which are at greater risk of being isolated and feeling lonely than healthy individuals. The literature has shown significant positive associations between loneliness and diverse type of addictions, such as alcohol [5], internet [6], Facebook [7], smartphone [8, 9], gambling [10] and food [11–13]. Without tackling social isolation and loneliness of individuals with addictive disorders, the vicious circle of addiction, loneliness, mental and physical illness may not end. In the case of drug addicts, Atadokht et al. [14] demonstrated a significant negative correlation between perceived social support and the frequency of relapse ($r=-0.34$, $P=0.001$).

One solution arises from self-help groups, that is, a supportive, educational, generally change-oriented group that addresses a specific life problem shared by all its member [15]. Involvement in a self-help group has proved efficient in reducing loneliness, social isolation [16, 17] and stress [18], as well as in improving meaning in life [19, 20], hope and health-promoting behaviors [21]. It also facilitates abstinence maintenance and symptoms reduction [22–24].

✉ Déborah Ducasse
d-ducasse@chu-montpellier.fr

[1] Lapeyronie Hospital, Montpellier, France

The more widely spread kind of self-help groups are twelve-step mutual help (TSMH) groups. TSMH are available for Alcoholic use disorder (alcoholic Anonymous; AA), substance use disorder (Narcotics Anonymous; NA), pathological gambling (Gamblers Anonymous; GA), eating disorder (Overeaters Anonymous; OA), dual diagnosis (Double Trouble in Recovery; DTR), compulsive sexual behavior disorder (CSBD; e.g. Sexaholics Anonymous; SA) and several other addictive behaviors (see Appendix A for a list of 28 TSMH groups). The 12-steps underlying the recovery culture of AA, NA, GA, OA, SA and DTR are described in Appendix B. Most of TSMH groups are born in the USA, and nowadays North America represents 75%, 68% and 57% of global face-to-face meetings in NA, OA and GA, respectively (see Appendix C for the breakdown of face-to-face NA, OA and GA meetings by geographical area).

Among all TSMH groups, AA is the first in history, the most widely spread worldwide, and the most studied by the literature (see Appendix D for detailed information on AA, NA, OA, GA, SA and DTR). Evidences attesting the efficacy and cost-efficiency of AA are robust. A meta-analysis of 27 studies, containing a total of 10,565 participants, demonstrated that participation in AA/TSMH for alcohol use disorder performed at least as well as established active comparison treatments (e.g. CBT) on all outcomes except for abstinence where it often outperformed other treatments [25]. Humphreys and Moos [26] found that patients treated in cognitive behavioral treatment (CBT) programs had 64% higher annual healthcare costs ($p=0.001$), compared to patients in AA/TSMH programs. Psychiatric and substance use outcomes were comparable across treatments, except that AA/TSMH participants had higher abstinence rates (45.7% AA/TSMH versus 36.2% in CBT; $P=0.001$). Mundt et al. [27] found that each additional AA meeting attended was associated with an incremental medical cost reduction of 4.7% during 7-year follow-up. Recovery in AA may stem from the ability of the group processes to augment self-efficacy, coping skills, and motivation, and by helping people build supportive and pro-social networks [28].

The large literature on AA is yet to be compared to the scarcer literature on other TSMH groups. In particular, no systematic review and meta-analysis have been performed for TSMH group other than for alcohol use disorder. The aim of this article is to fill-up this gap by providing a systematic review of TSMH groups other than AA, and whatever the addiction targeted by the group is, hence contributing to the growth of dimensional psychiatry. Both qualitative and quantitative studies were included in the review. The four meta-analyses performed were based on those studies which allowed evaluating Pearson correlation between (i) Duration or involvement in TSMH groups; and (ii) Severity of symptoms or quality of life. Since all addictions follow a similar pattern [29], we expected results similar to those demonstrated by Kelly et al. [25] regarding AA/TSMH for alcohol use disorder. That is, significant and negative (respectively, positive) association between higher duration or involvement in TSMH and lower severity of symptoms (respectively, higher quality of life).

Methods

A systematic review and meta-analysis was conducted following Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidance [30]. Sub-sections show, respectively, search strategy and selection criteria (2.1), data extraction (2.2), quality assessment (2.3) and statistical analysis (2.4).

Search strategy and selection criteria

Figure 1 details the flow of information through the different phases of the review. In the identification stage, two databases (MEDLINE, PsychInfo) and a register (ClinicalTrials) from inception through November 01 2022 (PROSPERO CRD42022342605), with no restrictions on language, were used to obtain peer-reviewed articles that would allow for an analysis of TSMH groups for disorders other than AA. We searched for (i) "12-step group" OR "12-step program" OR "12-step facilitation" OR "12-step approach" NOT alcohol; and (ii) all the "anonymous" TSMH groups listed in Appendix A. Both qualitative and quantitative studies were included in the review. Figure 1 shows the 8 exclusion criteria which, among other reasons, led to exclude studies that (i) mentioned TSMH group only in the introduction or discussion sections; (ii) Did not allow evaluating the efficacy of TSMH groups; (iii) were not based on face-to-face meetings; and (iv) involved the direct participation of a clinician in the meetings.

Data extraction

In the identification stage, the lead author independently scanned the abstract, title or both of every record to determine which studies should be considered for inclusion. Doubts were discussed with other authors. The review team included researchers with specialist background in mental health, psychology, public health, epidemiology, qualitative research, mood and emotional disorders.

In the screening stage, full-text articles were independently evaluated for inclusion by the lead author. Microsoft Excel

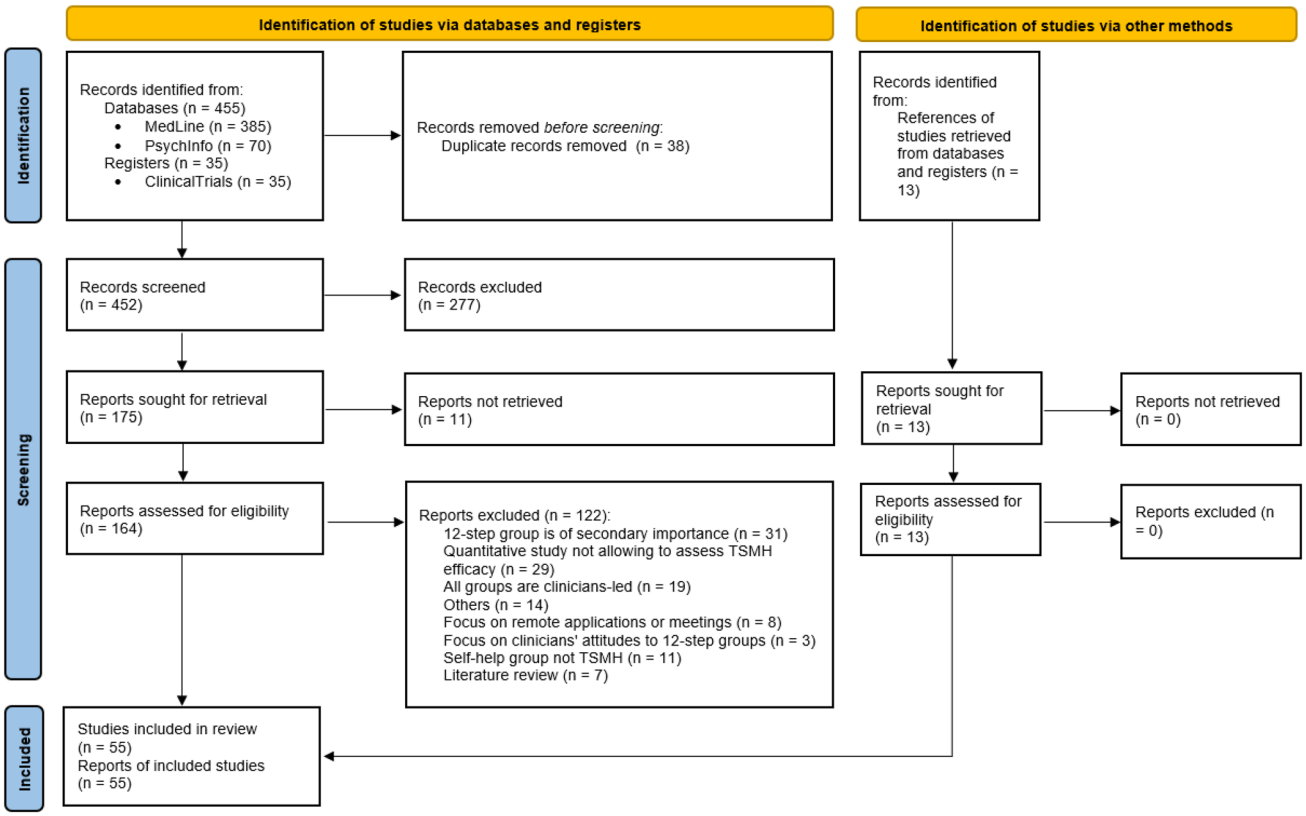

Fig. 1 Flow of information through the different phases of the review.2.2. Data extraction

was used to screen, remove duplicate entries, and record reviewers' decisions. On completion of database searching, additional records were identified through checking reference lists of each article collected after the screening stage. A data abstraction table (DAT) was designed and piloted. The lead author formed an initial conceptual framework presenting a preliminary synthesis of findings of included studies, the DAT was reviewed by the authors, and refined accordingly. The DAT included information about the name of the main TSMH group studied, author, country of study, participant demographics (age, gender, country, main disease, comorbidities, type and frequency of attendance to TSMH groups), study design, study measures and main results.

The data needed to perform meta-analyses was extracted by the lead author. The corresponding authors were contacted by email when data of relevance for the meta-analysis were insufficient in the published article. If we got no answer at first email, corresponding authors were contacted 2 more times.

Quality assessment

Two distinctive tools were applied to assess the risk of bias of quantitative studies (2.3.1) and qualitative studies (2.3.2).

Quantitative studies

Study quality of quantitative studies was examined adapting the tool used by Strahler et al. [31], a modified set of the quality criteria for primary research, as proposed in the Evidence Analysis Manual of the Academy of Nutrition and Dietetics [32]. Our final scoring sheet (see Appendix E) included 14 criteria (e.g. sampling adequately described and free from bias, clearly defined outcomes, reliability estimates of measures given, appropriate statistical procedures) with each criterion rated as "positive" if present (=2 points), "neutral" if the presence is ambiguous or when research is not exceptionally strong on this issue (=1 point), or "negative"

if not present (=0 point). We computed the quality score as the mean of responses across criteria that could be evaluated. Hence, scores could range between 0 and 2. For most articles, coding was independently performed by the first author. For the 9 studies used in meta-analyses, coding was discussed with the second author until 100% agreement was achieved.

Qualitative studies

Cochrane Qualitative and Implementation Methods Group recommendations [33] are to use a tool that takes the multidimensional nature of qualitative evidence into account. Guided by this perspective, the quality of included studies and risk of bias was assessed using the Critical Appraisals Skills Programme [34]. This tool is the most frequently recommended tool for qualitative studies [35]. The CASP tool focuses on three domains: study design, validity of results, and generalizability. Each domain is assessed using a set of questions. Based on the response to these questions the studies were marked as low, medium, or high quality. Studies which provided satisfactory information in all domains were marked as high quality, with missing or unsatisfactory information in one domain as medium quality, and with missing or unsatisfactory information in two or more domains as low quality.

Statistical analysis

The final effect size analyzed was Pearson correlation r. The four meta-analyses performed were based on the studies which allowed evaluating Pearson correlation between (i) duration or involvement in TSMH groups; and (ii) severity of symptoms or quality of life. No previously published protocol nor preregistration exists for these meta-analyses. All included studies collected an informed consent; therefore, an ethical approval was not obtained. However, these meta-analyses complied with the most recent version of the Declaration of Helsinki.

Statistical analysis was conducted with the R Software and following the guidelines of Harrer et al. [36]. As we anticipated considerable between-study heterogeneity, a random-effects model was used to pool effect sizes. Inverse variance weighting was applied to increase estimates' efficiency and give studies that have greater precision more weight. We used Knapp–Hartung adjustments [37] to calculate the confidence interval around the pooled effects.

To assess the heterogeneity and consistency of the estimated correlations, I^2 is used along its confidence interval (CI). I^2 indicate the percentage of variation caused by heterogeneity. 95% prediction intervals (PI) are also given for each pooled effect. Prediction intervals give a range into which we can expect the effects of future studies to fall based on present evidence. PI are calculated using the heterogeneity variance τ^2. The restricted maximum likelihood estimator [38] was used to calculate the heterogeneity variance τ^2. For each meta-analysis, I^2 was computed when excluding one study (for all possible configurations; leave-one-out analysis), and the case with the lowest I^2.When the total number of studies is small, detecting small-study effects is difficult. Egger's regression test is typically not advisable below 10 studies [39], as well as other methods to detect small-study effects/publication bias. In our case, the least worst method was P-curve analysis, which can be performed when between-study heterogeneity is low [36], and for meta-analyses of more than 3 studies.

Results

Sub-sections show, respectively, systematic review and meta-analysis of quantitative studies (3.1) and systematic review of qualitative studies (3.2). Articles using mixed-methods are discussed either in subSect. "Systematic review and meta-analysis of quantitative studies" or subSect. "Systematic review of qualitative studies", where thought to be most relevant. Figure 2 shows the breakdown of the included papers by type of TSMH group. There are a total of 55 included papers, corresponding to 47 distinctive studies.

Systematic review and meta-analysis of quantitative studies

Sub-Sect. "Systematic review and meta-analysis of quantitative studies" depicts the results regarding the systematic review of quantitative studies (3.1.1) and meta-analysis (3.1.2).

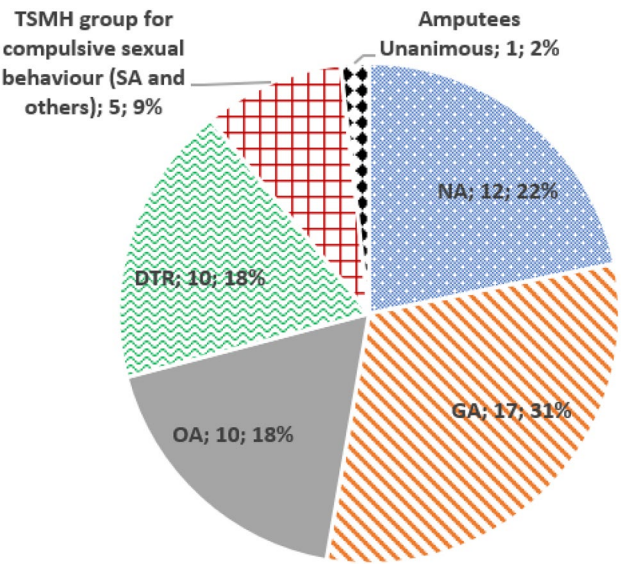

Fig. 2 Breakdown of the 55 included articles by type of TSMH group

Table 1 Overview of quantitative studies characteristics

Authors	Methods		Participants			Main result	Quality (0…2)
	Setting of recovery	Study design	Total sample (Male)	Mean age + − SD	Country		
Toumbourou et al. (2002) [40]	NA	Cohort study	91 (63%)	33.1 + − 8.2	Australia	At 12-months follow-up, Number of Months of at least weekly attendance in NA is significantly correlated with hazardous alcohol use ($r = -0.55$, $p < 0.001$) and Marijuana use ($r = -0.38$, $p < 0.01$). Highest NA step completed is significantly correlated with hazardous alcohol use ($r = -0.33$, $p < 0.05$). Number of service roles is significantly associated with hazardous alcohol use (r = − 0.43, p < 0.001)	1.69
Chen (2006) [41]	NA (53.7%), NA + 12-step course (64.3%)	Non-randomized study with a separate control group	93 (100%)	36 ± 6.4	Israel	The change of meaning in life for the NA only group was significant (Friedman's $\chi 2 = 6.92$, 2 df, $p < 0.05$). The difference between the first and last measurements also proved significant (Mann-Witney's $z = 2.84$, $p < 0.01$), showing an increase in meaning in life for NA only group during a period of 1 year. In the final measurement, nearly 30% ranked meaning in life in the highest category, compared to 10% in the first measurement	1.82

Table 1 (continued)

Authors	Methods		Participants			Main result	Quality (0…2)
	Setting of recovery	Study design	Total sample (Male)	Mean age + − SD	Country		
Galanter et al. (2013) [42]	NA	Cross-sectional study	527 (72%)	49 ± 13	USA	NA beliefs is significantly correlated to levels of craving for substance ($r = -0.266$, $p < 0.001$) and to number of years abstinent ($r = 0.214$, $p < 0.001$). NA affiliation is significantly correlated to levels of craving for substance ($r = -0.241$, $p < 0.001$) and to number of years abstinent ($r = 0.139$, $p < 0.01$)	1.55
Monico et al. (2015) [43]	NA	Mixed-method, Cohort study, semi-structured interviews	Cohort study = 300 (60%) Semi-structured interview = 20	46.1 + 6.3	USA	Number of NA meetings in the prior 6 months is significantly correlated to heroin/cocaine abstinence ($r = 0.27$, $p < 0.05$). TSMH members' view that buprenorphine maintenance is a recovery "crutch," and the discounting of "clean time" accumulated while taking buprenorphine, is a difficulty for buprenorphine treatment patients	1.33
Azkhosh et al. (2016) [44]	CBT (33.3%), NA (33.3%), methadone maintenance treatment (33.3%)	RCT	60	27.5 ± 7.2	Iran	Compare to baseline, psychological well-being were 23% (respectively 33%) higher at the 12 week follow-up (=end of treatment) for the NA group (respectively the CBT group). Compare to baseline, psychological well-being were 15% (respectively 17%) higher at the 18 week follow-up for the NA group (respectively the CBT group)	1.79

Table 1 (continued)

Authors	Methods		Participants			Main result	Quality (0…2)
	Setting of recovery	Study design	Total sample (Male)	Mean age + − SD	Country		
Galanter et al. (2019) [45]	NA	Cross-sectional study	262 (94%)	42.4 ± 9.5	Iran	NA affiliation is significantly correlated to number of years abstinent ($r = 0.138$, $p < 0.05$). Number of NA meetings last year is significantly correlated to level of cravings for substance (r = -0.144, p < 0.05)	1.63
Maton (1988) [46]	Compassionate Friends (CF) (33.3%); Multiple Sclerosis (MS) (33.3%); OA (33.3%)	Comparative effectiveness research	144	45	USA	Time in Group was inversely related to Depression for members of life stress (CF) and medical disorder (MS) groups, but not for members of OA. For OA members, self-esteem was significantly correlated to support provided ($r = 0.47$, $p < 0.01$) and to support received (0.29, $p < 0.05$) to/from other OA members	1.38
Maton (1989) [47]	Compassionate Friends (33.3%); Multiple Sclerosis (33.3%); OA (33.3%)	Comparative effectiveness research	144	45	USA	Among the 48 OA members: Support received from the group was significantly correlated with group satisfaction ($r = 0.52$; $p < 0.01$), perceived group benefits ($r = 0.34$; $p < 0.05$) and self-esteem ($r = 0.29$; $p < 0.05$); Support provided was significantly correlated with self-esteem ($r = 0.47$; $p < 0.01$) and perceived group benefits ($r = 0.27$; $p < 0.05$); Friendships was significantly correlated with benefits ($r = 0.45$; $p < 0.01$)	1.49

Table 1 (continued)

Authors	Methods		Participants			Main result	Quality (0…2)
	Setting of recovery	Study design	Total sample (Male)	Mean age + − SD	Country		
Kriz (2002) [48]	OA	Mixed-method: Dissertation	231 (16%)	50	USA	Longer lengths of involvement in OA, a decrease in the frequency of relapse or 'slips', performing service, greater attendance at meetings, and progress on the ninth step, are predictors of abstinence at the 0.05 level of significance. A lower frequency of relapse was predicted by longer lengths of involvement in OA, greater adherence to a food plan, increased frequency of phone calls to other members, and more time spent writing about one's thoughts and feelings at the 0.05 level of significance	1.51
Petry (2003) [49]	Non-GA attendes (46%); GA attendes (54%)	Cross-sectional study	342 (60%)	43	USA	At baseline, GA attendees had 14% more severe gambling problems than non-GA attendees. At the 2-month follow-up: 48% (respectively 36%) of GA attendees (respectively non GA attendees) were abstinent ($p < 0.01$)	1.53
Cooper (2004) [50]	GA	Mixed-method, cross-sectional study	50 (52%)	43.3	Canada	61.5% of the sample reported that they avoided GA because of concerns regarding others' opinions. Those who reported that their GA affiliations were ''extensive'' had 54% lower stigma scores than non-extensive GA attendees and 58% lower than those who did not receive any form of treatment	1.66
Petry et al. (2006) [51]	GA referral alone (28%); GA referral + cognitive- behavioral (CB) workbook (36%); GA referral + 8 sessions of individual CB therapy (36%)	Randomized controlled trial	220 (53%)	45	USA	At 12-month follow-up, percentages classified as abstinent or substantially reduced gambling were 60.5%, 60.0%, and 65.7% in the GA referral, CB workbook, and CB therapy conditions, respectively	1.73

Table 1 (continued)

Authors	Methods		Participants			Main result	Quality (0…2)
	Setting of recovery	Study design	Total sample (Male)	Mean age + − SD	Country		
Petry et al. (2007) [52]	GA referral alone (43%); GA referral plus Cognitive-behavioral therapy (CBT; 57%)	Randomized controlled trial	147 (55%)	45.8 + 11.7	USA	Between baseline and 12-month follow-up, symptoms of pathological gambling were reduced by -39% and -67% in the in GA referral and CB therapy conditions, respectively	1.83
Oei and Gorden (2008) [53]	GA abstinent from gambling for at least 12 months prior to completing the questionnaire (59%); GA members which have gambled in the 12 months prior to completing the questionnaire (41%)	Cross-sectional study	75 73%)	45 ± 10	Australia	Attendance and Participation to GA ($r=0.73$), and Social Support ($r=0.70$) were the most important factors in predicting membership in the abstinent vs relapse groups, followed by Gambling Urges ($r=0.55$). The 12-steps to Recovery ($r=0.49$), and Erroneous Cognitions ($r=0.41$) provided moderate prediction ability, whereas Belief in a Higher Power ($r=0.35$) and God Belief ($r=0.23$) were the least important	1.49
Gomes and Pascual-Leone (2009) [54]	GA	Cross-sectional study	60 (54%)	46.7	Canada	GA involvement was significantly associated with readiness for change ($r=0.318$, $p<0.05$), but was not significantly associated with abstinence self-efficacy and motivation for change	1.82
Grant et al. (2011) [55]	Imaginal desensitization + motivational interviewing (IDMI; 49%); GA (51%)	Randomized controlled trial	68 (37%)	49	USA	63.6% (respectively, 17.1%) of the IDMI (respectively, GA) group participants were abstinent from all gambling for at least 1 month by the end of the 8-week period. The severity of pathological gambling decreased by 42–53% in the IDMI group after 6-sessions (there were two distinct measures), versus a decrease of 8% in the GA group. The quality of life of increased by + 12% in the IDMI group, versus + 4% in the GA group	1.39

Table 1 (continued)

Authors	Methods		Participants			Main result	Quality (0…2)
	Setting of recovery	Study design	Total sample (Male)	Mean age + − SD	Country		
Wright (2010) [56]	Unspecified TSMH for CSBD	Cohort study	97 (100%)	51 ± 11.91	USA and Canada	Meeting attendance (respectively working with a sponsor) at T1 was associated with lower levels of sexual compulsivity at T2; $r = -0.35$, $p < 0.01$ (respectively $r = -0.33$, $p < 0.01$)	1.25
Efrati and Gola (2018) [57]	SA	Cross-sectional study	97 (98%)	30.2 ± 7.3	Israel	Advancement in the SA program, measured as a current step of the program, is significantly correlated to lower levels of Sexual-related lack of control ($r = -0.51$, $p < 0.001$), severity of symptoms (CSB; $r = -0.40$, $p < 0.001$), sexual-related unwanted consequences ($r = -0.39$, $p < 0.001$), self-control ($r = 0.39$, $p < 0.001$), sexual-related overall sense of helplessness (5 items, r between − 0.28 and − 0.35, $p < 0.01$), and well-being ($r = 0.29$, $p < 0.001$) Number of months in SA is significantly correlated to severity of symptoms (CSB; $r = -0.26$, $p < 0.05$)	1.55
Wnuk and Charzyńska (2022) [58]	SA	Cross-sectional study	80 (90%)	39 ± 10.6	Poland	SA involvement was moderately positively correlated with hope ($r = 0.38$; $p < 0.001$) and life satisfaction ($r = 0.44$; $p < 0.001$), and weakly positively correlated with the presence of meaning in life ($r = 0.29$; $P < 0.010$) SA involvement was not significantly correlated with severity of symptoms (CSB; $r = 0.03$, $p > 0.05$)	1.41

Table 1 (continued)

Authors	Methods		Participants			Main result	Quality (0…2)
	Setting of recovery	Study design	Total sample (Male)	Mean age + − SD	Country		
Magura et al. (2003) [21]	DTR	Cohort study	310 (72%)	40.2 ± 8.6	USA	The degree of DTR affiliation during the follow-up period was significantly associated with drug/alcohol abstinence ($r = 0.15$, $p < 0.01$), health-promoting behaviors ($r = 0.16$, $p < 0.01$) and internal locus of control ($r = 0.32$, $p < 0.001$)	1.33
Laudet et al. (2004) [59]	DTR	Cohort study	310 (72%)	40.2 ± 8.6	USA	Longer DTR participation during the first year of the study was associated with lower substance use in the second year ($r = -0.26$, $p < 0.05$)	1.47
Magura et al. (2007) [60]	DTR	Cohort study	310 (72%)	40.2 ± 8.6	USA	Greater DTR Affiliation was significantly associated with increased Self-efficacy for Recovery (pseudo-partial correlation $r = 0.23$, $p < 0.01$). Self-efficacy was significantly associated with quality of life (3 measures with r between 0.55 and 0.65, $p < 0.01$)	1.69

Table 1 (continued)

Authors	Methods		Participants			Main result	Quality (0…2)
	Setting of recovery	Study design	Total sample (Male)	Mean age + − SD	Country		
Magura et al. (2008a) [61]	DTR	Cohort study	310 (72%)	40.2 ± 8.6	USA	Participants attended DTR meetings for a mean of 5.4 months. Since they started attended DTR, 53% stated there were a lot more taking care of themselves (eating, getting enough sleep, personal hygiene), being assertive and standing-up for themselves. 58% claimed dealing with mental health issues got a lot better and 70% that drug use changed a lot DTR attendance was significantly correlated ($p < 0.05$) with self-efficacity for recovery ($r = 0.25$) and changes in recovery behaviours ($r = 0.23$). Satisfaction with DTR meetings was significantly correlated ($p < 0.01$) with Helper-Therapy Scale ($r = 0.52$), Reciprocal Learning Scale ($r = 0.49$), Emotional Support Scale ($r = 0.47$), Self-Efficacy for Recovery ($r = 0.55$)	1.37
Magura et al. (2008b) [62]	Pre-DTR cohort (35%) with no access to DTR meetings for 6 months; Post-DTR cohort (65%) with access to DTR meetings in the past 6-months	Cohort study	229	39 ± 9.1	USA	At 6-month follow-up, the DTR cohort as compared with the non-DTR cohort comprises 15% less individual that used alcohol or any drugs over the past 90 days, attended to 36% more traditional 12-step groups outside of the program and had 15% lower psychiatric medication non-adherence. There were no differences in psychiatric symptoms or program retention	1.57

Table 1 (continued)

Authors	Methods		Participants			Main result	Quality (0…2)
	Setting of recovery	Study design	Total sample (Male)	Mean age + − SD	Country		
Rosenblum et al. (2014) [63]	DTR (57%); non-DTR (43%)	Randomized controlled trial	203 (68%)	43 ± 11	USA	DTR subjects compared with control subjects used alcohol ($p=0.03$) and any substances ($p=0.02$) 66% less days over the past 30 days of the 6-month follow-up measurement DTR compared with control subjects were 14% (respectively 38%) more likely to rate themselves as experiencing better mental health (respectively fewer substance use problems), with $p=0.001$ There were no effects for DTR on drug use only, medication adherence or NA/AA attendance There is a significant association between more frequent DTR attendance and fewer days heavy drinking at follow-up among Michigan subjects ($\beta=0.31$, df = 53, $p=0.01$)	1.70
Bogenschutz et al. (2014) [64]	Twelve-step Facilitation (DTR + Facilitation with a therapist; 69%); Treatment as usual (31%)	Randomized controlled trial	121 (53%)	42	USA	TSMH attendance ($b=0.13$) significantly predicted later increases in the proportion of alcohol abstinent days, t(393) = 3.19, $p<0.002$ TSMH attendance significantly predicted later reductions in drinks per drinking day, t(393) = − 3.68, p < 0.001	1.75

Systematic review of quantitative studies

Twenty-three quantitative-only articles (7 cross-sectional studies, 7 cohort studies, 6 randomized control trials, 2 comparative effectiveness research, 1 non-randomized study with a separate control group) and 3 mixed-methods papers are presented in Table 1. All those 26 papers were rated to be of at least moderate quality; scores ranged from 1.25 to 1.83, with a mean of 1.56 (SD 5 0.17). These 26 papers correspond to a total of 22 distinctive studies. Most studies were conducted in North America ($n=15$). The mean age is 43.6. Due to research protocol (see 2.1), all these studies aimed to test the impact of duration in TSMH or TSMH involvement on outcomes (e.g. severity of symptoms, quality of life, self-efficacy, self-esteem). They all showed a significant, therapeutical impact on at least one outcome.

Meta-analysis

Studies measuring any severity of symptom measures in relation to duration in TSMH.

We computed the pooled correlation as effect size across the 8 studies examining any severity of symptom measure in relation to duration in TSMH (n = 1,209). The measures used in each study are given in Appendix F, Table 10. The participants' average age was Mpooled = 40.5 years (SDpooled = 11.16). 81% were male.

The results presented in Table 2, 3 revealed a significant pooled correlation of $r=-0.20$ ($p<0.01$). The effect size across all studies is shown in Fig. 3. The between-study heterogeneity variance was estimated at $\tau^2=0.0081$ (95%CI 0.0000–0.0918), with an I^2 value of 51% (95% CI 0–78%). The prediction interval ranged from g = − 0.42 to 0.04, indicating that positive correlation cannot be ruled out for future studies. When removing the study with the largest influence on I^2, [58], $n=1,227$, I^2 is 22% (95% CI 0–65%), and prediction interval ranged from g = -0.29 to − 0.14.

Risk of bias across studies The results of the *p*-curve analysis are reported in Table 2. When removing [58], $I^2=22\%<50\%$. Overall, these results indicate the presence of evidential value and that there is a true non-zero effect. We can still not rule out that publication bias has affected the results of our meta-analysis. But, based on p-curve's results, we can conclude that the pooled effect found is not totally spurious.

Studies measuring any Severity of symptom measures in relation to TSMH involvement. We computed the pooled correlation as effect size across the 5 studies examining any severity of symptom measure in relation to TSMH involvement ($n=1019$). The measures used in each study are given in Appendix F, Table 11. The participants' average age was Mpooled = 38.8 years (SDpooled = 11.3). 80% were male.

The results presented in Table 3 revealed a non-significant correlation of $r=-0.21$ ($p=0.063$). The effect size across all studies is shown in Fig. 4. The between-study heterogeneity variance was estimated at $\tau^2=0.0237$ (95% CI 0.0033; 0.2894), with an I^2 value of 76% (95% CI 42–90%). The prediction interval ranged from g = − 0.64 to 0.33, indicating that positive correlation cannot be ruled out for future studies. When removing the study with the largest influence on I^2, [45], the pooled correlation is even less significant (see Table 3). However, when removing [58], a significative correlation is found, of $r=-0.25$ ($p=0.045$). $N=757$, I^2 is 75% (95% CI 30–91%), and prediction interval ranged from g = − 0.73 to 0.39. No p-curve analysis were led here as I^2 is high [36].

Studies measuring any Quality of life measures in relation to Duration in TSMH. We computed the pooled correlation as effect size across the 3 studies examining any quality of life measure in relation to duration in TSMH ($n=259$). The measures used in each study are given in Appendix F (Table 12). The participants' average age was Mpooled = 37.4 years (SDpooled = 9.8). 80% were male.

The results presented in Table 3 revealed a correlation approaching significance of $r=0.10$ ($p=0.052$). The effect size across all studies is shown in Fig. 5. The between-study heterogeneity variance was estimated at $\tau^2=0$ (95% CI 0.0000; 0.0538), with an I^2 value of 0% (95% CI 0–90%). The prediction interval ranged from g = − 0.61 to 0.72, indicating that positive correlation cannot be ruled out for future studies. No influential case was removed as there were only 3 studies pooled.

Studies measuring any Quality of life measures in relation to TSMH involvement. We computed the pooled correlation as effect size across the 3 studies examining any quality of life measure in relation to TSMH involvement ($n=478$). The measures used in each study are given in Appendix F (Table 13). The participants' average age was Mpooled 36.5 years (SDpooled 5 8.7). 80% were male.

The results presented in Table 3 revealed a non-significative correlation of $r=0.28$ ($p=0.09$). The effect size across all studies is shown in Fig. 6. The between-study heterogeneity variance was estimated at $\tau^2=0.0187$ (95% CI 0.0000; 1.0119), with an I^2 value of 70% (95%CI: 0–91%). The prediction interval ranged from g = − 0.95 to 0.98, indicating that positive correlation cannot be ruled out for future studies. No influential case was removed as there were only 3 studies pooled.

Summary of findings of meta-analyses. Table 3 summarizes the results that were obtained when pooling Pearson correlation r.

Systematic review of qualitative studies

Twenty-eight qualitative papers and 1 mixed study are presented in Table 4. Of the 28 articles, 12 (41%) were rated high quality, 11 (38%) medium and six (21%) low quality. These articles correspond to a total of 24 distinctive studies. Interviews were used by 14 studies (58%), participant observation by 7 (29%), focus groups by 5 (21%), survey-only by 2 (8%) and case report by 2 (8%). Studies were conducted in North America ($n=17$), Middle East ($n=4$) and Europe ($n=4$). 20 of the 24 studies brought evidence on the factors influencing recovery, highlighting the following: Social ($n=15$), emotional ($n=9$), spiritual ($n=7$), self-identification or psychological ($n=6$).

Discussion

Primary outcome was to strengthen knowledge on TSMH groups other than AA, which can be used by support services to inform the development of future research, policy, and practice within healthcare and other settings. Subsection 4.1 provides a summary of the knowledge gathered about the 5 types of TSMH group addressed in this article, each focusing on a specific addiction. The possibility to develop TSMH groups targeting ontological addiction, at the root of all others addictions, is then discussed in SubSect. "TSMH group for the root of all addictions: Ontological addiction?" . Sect. "Discussion" ends with the limitations of this paper.

Table 2 Results of the P-curve analysis concerning correlation between severity of symptoms and duration in TSMH. Omitting Wnuk and Charzyńska (2022) [58]

	$P_{Binomial}$	Full Curve		Half Curve		Evidential value	
		Z_{Full}	P_{Full}	Z_{Half}	P_{Half}	Present	Absent
Right-Skewness Test	0.016	− 4.251	0.000	− 3.03	0.001	Yes	No
Flatness Test	1.000	2.282	0.989	3.60	1.000	Yes	No

Table 3 Main results regarding the 4 pooled effect size calculated

	Number of studies (number of subjects)	Effect size r	95%CI	*p*	95%PI	I^2	95%CI
Severity of symptom and duration in TSMH	8 (1306)	− 0.20	− 0.31–0.09	< 0.01	− 0.42–0.04	51%	0–78
Severity of symptom and duration in TSMH *(*)*	7 (1227)	− 0.22	− 0.29–− 0.14	< 0.001	− 0.20– − 0.14	22%	0–65
Severity of symptoms and TSMH involvement	5 (1019)	− 0.21	− 0.41–− 0.02	= 0.06	− 0.64–0.33	76%	42–90
Severity of symptoms and TSMH involvement *(*)*	4 (940)	− 0.25	− 0.46 – − 0.01	< 0.05	− 0.73–0.39	75%	30–90
Quality of life and duration in TSMH	3 (259)	0.10	0.00–0.20	= 0.052	− 0.61–0.72	0%	0–90%
Quality of life and TSMH involvement	3 (478)	0.28	− 0.11–0.60	= 0.09	− 0.95–0.98	70%	0–91

CI confidence interval (*) When removing an influential case: Wnuk and Charzyńska [58]

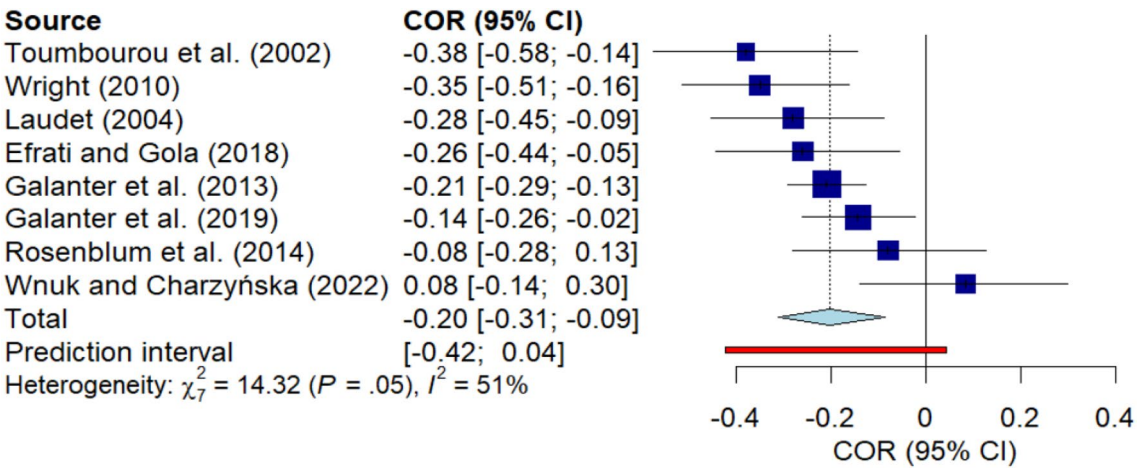

Fig. 3 Forest plot of all studies examining correlation between any severity of symptom measure and duration in TSMH

Summary of the knowledge gathered regarding the five types of TSMH groups studied

Narcotics Anonymous. Over the 55 included papers, 22% deal with NA. However, this systematic review excludes papers which do not allow to distinguishing NA from AA members. The search in Pubmed of "Narcotics Anonymous" AND "Alcoholics Anonymous" gives 83 results (on the 22/12/2022), suggesting that many papers are dealing with both NA and AA without distinction (e.g. Andraka-Christou et al. [94]). Research on the effectiveness of NA show a robust level of evidence: One RCT [44], 2 cross-sectional studies [42, 45], one non-randomized study with a separate control group [41], one cohort study [40] and six qualitative studies [65–70]. These studies are generally supportive of NA's effectiveness. Vederhus and Birkland [70] yet highlights that NA model do not fit all. Besides, NA members may stigmatized patients using buprenorphine [43] and methadone ([43, 95]) for treatment purposes.

Overeaters anonymous. OA is overlooked by the TSMH literature. Over the 55 included papers, there are 1.7 times more GA articles than OA articles. Worldwide, there are 2.4 times more OA than GA meetings (see Appendix D). OA is particularly underrepresented in quantitative studies (12% of total, versus 24% in qualitative studies). Research on the effectiveness of OA is limited to lower levels of evidence: a 2002 dissertation [48], one study comparing effectiveness of OA to weight watchers and multiple sclerosis mutual help groups ([46, 47]), two case reports ([71, 76]) and five qualitative studies ([72–75, 77, 96]). These studies generally support OA's effectiveness, and highlight the need for higher quality research, including randomized controlled trials. Future research on OA should rely upon the good quality literature review of Bray et al. [97].

Gamblers anonymous. GA is over studied by the TSMH literature, when considering the number of GA meetings relative to others TSMH (see Appendix D). Over the 55 included papers, 31% deal with GA. Research on the effectiveness of GA show a robust level of evidence: two RCT (which led to 3 articles [51, 52, 55]:), four cross-sectional studies ([49, 50, 53, 54]) and seven qualitative studies (which led to 10 articles [49, 78, 79, 81–87]:). These studies are generally supportive of GA's effectiveness. Schuler et al. [98] mitigate these results by indicating that larger RCT are needed to prove the effectiveness of GA either as a control condition or in conjunction with formal treatment or medication. Specificities of GA relative to other TSMH groups include (i) a focus on steps 4 and 9 (see Appendix B for the 12-steps); (ii) devoting much time and energy to counselling members on financial and special challenges; (iii) making direct comments during meetings (relative to others TSMH groups in which members avoid addressing one another directly); (iv) absolute assertion of identity as a ''compulsive gambler''. Future research

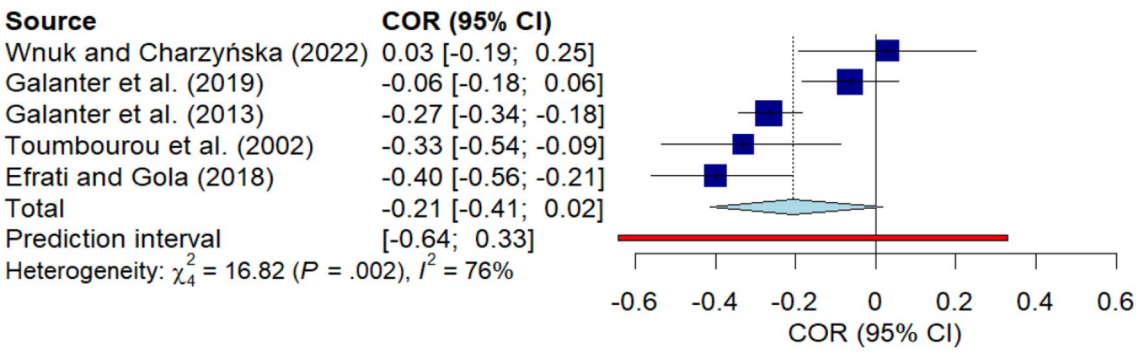

Fig. 4 Forest plot of all studies examining correlation between any severity of symptom measure and TSMH involvement

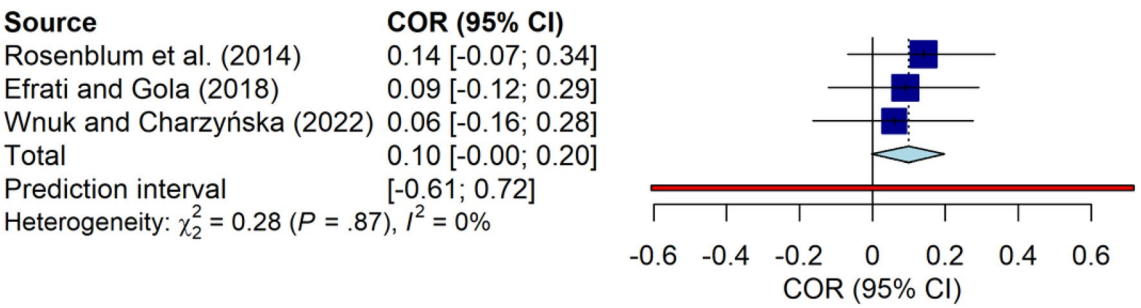

Fig. 5 Forest plot of all studies examining correlation between any quality of life measure and TSMH involvement

on GA should rely upon the good quality scoping review of Schuler et al. [98].

TSMH group for compulsive sexual behavior disorder. Over the 55 included papers, 9% are dealing with a TSMH group for CSBD. Research on the effectiveness of those TSMH groups shows medium level of evidence, with two cross-sectional studies [57, 58], one cohort study [56] and one qualitative research [88]. These studies are generally supportive of TSMH's effectiveness, by e.g. lowering the sexually related sense of helplessness and narrowing the repression away from sexual thoughts [57]. The tree studies hereafter worth to be noticed, even though not being included in this paper as they do not deal specifically with TSMH experience but rather focus on the recovery from compulsive sexual behaviors. Dhuffar-Pottiwal and Griffiths [99] analyzed recovery experiences of three Sex and Love Addicts Anonymous members from the UK, restricting their sample to female-only participants. Yamamoto [100] analyzed recovery experiences of four heterosexual men from unspecified sex groups. Antons et al. [101] performed a systematic review identifying 24 treatment studies on CSBD and problematic pornography use as well as treatment effects on symptom severity and behavior enactment.

More research (including RCT) on TSMH for CSBD is needed, as CSBD seem to be increasing in several countries ([57, 58, 89, 102]). In 2019, the World Health Organization (WHO) included the diagnosis of CSBD as an impulse control disorder in the eleventh revision of the International Classification of Diseases (ICD-11; WHO, 2019). In Iran, the number of SA meeting per week grew from 557 in 2016 to 1,246 in 2018 [102]. Future research could consider using the recently developed CSBD Scale (CSBD-19 [104];) that assesses CSBD based on ICD-11 diagnostic guideline. Practitioners may want to activate TSMH group meetings for CSBD in prisons, especially for prisoners of sexual crimes [102].

Double trouble in recovery. DTR is over represented in the TSMH literature. 18% of the 55 included papers deal with DTR. DTR however, has the fewest number of TSMH groups among those studied in this paper. In 2008, there were about 200 DTR groups in the USA across 14 states [61]. The authors are not aware of any DTR groups outside the US. PubMed. Thirteen papers on DTR were published between 2002 and 2015, among which 5 are based on the same study/sample ([21, 59, 60, 62, 105]), and authors are all connected through common institutions, universities or states. There are no published papers since 2015. The current activity level of DTR groups is unclear.

Studies on the effectiveness of DTR show a robust level of evidence: two RCT ([63, 64]), one large ($n=310$) cohort study that led to four articles ([21, 59–61]), one other cohort study [62], one mixed-method [90] and two qualitative papers ([91, 92]). These studies are generally supportive of DTR's effectiveness, by offering a place where persons with a dual diagnosis can support, share and educate one another on their comorbidity without fear of stigma [92]. Yet, even though DTR is not widely available, this should not necessarily inhibit healthcare professionals to encourage dual diagnosis patients to attend other TSMH groups, being aware that, "one size does not fit all" [70]. It is important however, that such TSMH groups will be receptive to dual diagnosed patients and will not stigmatize or in any way discriminate against them. As long as this principle is held, the type of TSMH group attended is of secondary importance on the positive therapeutic impact of TSMH ([70, 92, 106]). Following Rosenblum et al. [63], healthcare professionals offering an intensive referral and/or motivation enhancement component might facilitate better attendance at TSMH meetings.

TSMH group for the root of all addictions: ontological addiction?

We advocate that coupling TSMH group with 3rd wave CBT [109], which are specifically designed to cure ontological addiction, is a promising avenue for more efficient, transnosographic TSMH groups. According to ontological addiction theory [107], the root of the suffering of mental unsatisfaction is an addiction to try satisfying an incorrect self-concept. The incorrect self-concept (i) is perceived

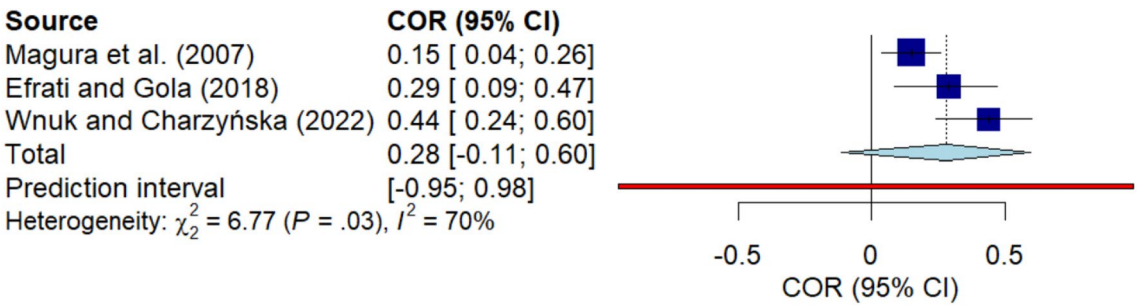

Fig. 6 Forest plot of studies examining correlation between any quality of life measure and TSMH involvement

Table 4 Overview of qualitative studies characteristics

Authors	Methods		Participants				Main result	Quality
	Setting of recovery	Study design	Total sample age (Male)	Mean age ± SD	Country	Length of recovery		
Ronel (1997) [65]	NA	Participant observation, open-ended interviews and informal conversations	Participant observation = + 300 NA meetings Open-ended interviews = 21		Israel		Substance-dependents in Israel accepted most "American" components of the NA program unquestioningly. However, two discrete features of Christian ideology required conscious incorporation by NA's Israeli members: (1) the concept of a "Loving God" who is non-punitive, which for many members was opposed to their traditions and upbringing, and (2) kneeling to pray	Low
Green et al. (2005) [66]	NA	Participant observation	95 NA meetings (15–45 people by meeting)		USA		Recovery from crack addiction always included a reorganization of sex and relationships. This depended on the accumulation of listening and sharing in the NA meetings. Responsibility, kindness, humility, and openness were all key features of a sober state	High

Table 4 (continued)

Authors	Methods		Participants				Main result	Quality
	Setting of recovery	Study design	Total sample age (Male)	Mean age ± SD	Country	Length of recovery		
Christensen (2017) [67]	NA	Participant observation; interview	Interview = 9 (89%)	All participants are above 40	USA	Active in NA for at least five years	Despite the valuable features of NA meetings, NA's ideological approach blinds group members and the larger public to the complexity of addiction, turning addicts who struggle with recovery into failures, through internalized ideological trajectories that root responsibility in the self while discounting context	Medium

Table 4 (continued)

Authors	Methods		Participants				Main result	Quality
	Setting of recovery	Study design	Total sample age (Male)	Mean age ± SD	Country	Length of recovery		
Jalali et al. (2019) [68]	NA	Semi-structured interview	12	38.6 ± 7	Iran	2 years	Two types of factors related to treatment retention in NA. Personal-psychological factors includes: self-knowledge, change of attitude, self-confidence, consistency in treatment, living in the moment.Social factors include interaction with others, group of sympathizers, reformation of social and familial relationships, reclaiming the social position, supports received from others, and supports received from the generalized network	High
Dekkers et al. (2020) [69]	NA	In-depth interviews	11 (73%)	37 (22–51)	Belgium (Flanders)	4 months to 25 years	Connectedness is a key recovery component of NA, enabled by a non-judgemental approach and by mutual understanding through sharing	High

Table 4 (continued)

Authors	Methods		Participants				Main result	Quality
	Setting of recovery	Study design	Total sample age (Male)	Mean age ± SD	Country	Length of recovery		
Vederhus et al. (2020) [70]	NA	Semi-structured interview	10 (60%)	50	Norway	2 years	Three themes are put forward to explain disengagement from NA: (1) "The model did not fit", either the strategies utilized in NA (e.g., meeting format and step working) or NA's explanatory model of addiction; (2) "Negative experiences spurred frustration", and (3) "The safe place can become a cage"	High
Yeary (1987) [71]	OA	Case report	1 (0%)	32	USA		OA helps to give the person a chance to socialize and to develop interpersonal skills that are generally lacking for the person with an eating disorder	Low
Weiner (1998) [72]	OA	Participant observation			USA		OA emphasizes the psychological and spiritual components, with its main focus being the commitment to the group	Low

Table 4 (continued)

Authors	Methods		Participants				Main result	Quality
	Setting of recovery	Study design	Total sample age (Male)	Mean age ± SD	Country	Length of recovery		
Wasson & Jackson (2004) [73]	OA	Focus groups and interviews	26 (0%)	20–59	USA	Six months of uninterrupted recovery from binge eating and purging	Participants used five OA skills or strategies: (1) OA meeting attendance and participation, (2) interaction with a sponsor, (3) processing (i.e., writing and journaling), (4) spirituality (i.e., prayer and meditation), and (5) adherence to a food plan	High
Russell-Mayhew et al. (2010) [74]	OA	Focus groups	3 groups with a total of 20 persons (95%)	53.6 ± 8.1	Canada		Many participants attributed the emphasis placed on emotional and spiritual aspects of recovery as a reason that OA is effective Conceptualizing the eating problem as an addiction had value for OA members, as did the practical tools and spiritual nature of the group	Medium

Table 4 (continued)

Authors	Methods		Participants				Main result	Quality
	Setting of recovery	Study design	Total sample age (Male)	Mean age ± SD	Country	Length of recovery		
Hertz et al. (2012) [75]	OA	Semi-structured interviews	20 (0%)	26–62	Israel	Minimum one year of OA membership	The tools used for spiritual and emotional work at OA are essential to recovery. The experience of secure attachment is likely to occur within OA when safe ground is provided and positive attachment figuress are accessible	Medium
Rodríguez-Martín et al. (2020) [76]	OA	Case report	1 (0%)	20	USA	12 Steps Minnesota Treatement + two-year follow-up in OA	Although purgative and self-injurious behaviours stopped during admission, it is not until the second year of follow-up that the patient which suffer from anorexia nervosa manages to reach weight indicators that can be considered within the range of the norm	Medium

Table 4 (continued)

Authors	Methods		Participants				Main result	Quality
	Setting of recovery	Study design	Total sample age (Male)	Mean age ± SD	Country	Length of recovery		
Martin (2002) [77]	Weight Watchers, Overeaters Anonymous, the National Association to Advance Fat Acceptance (NAAFA)	Participant observation	49 (6%)		USA		Frame alignment is accomplished in Weight Watchers by group leaders emphasizing rationality with regards to food, body, and social relationships. Within Overeaters Anonymous, a redemptive frame is constructed that transforms the dieting practices of its members into a spiritual activity	High
Cromer (1978) [78]	GA	Participant observation	First GA group in Israel		Israel		Compulsive gamblers who wish to rid themselves of their addiction must go through the three major stages in GA: Destruction of the old identity (status degradation), the influence of significant others (differential association), and ritual involvement in the new self (time usage)	Low

Table 4 (continued)

Authors	Methods		Participants				Main result	Quality
	Setting of recovery	Study design	Total sample age (Male)	Mean age ± SD	Country	Length of recovery		
Browne (1991) [79]	GA	Participant observation, interview	GA/AA meetings = 70/100; GA/AA member interviews = 9/5 (+3 meetings each at OA, CDA, ACD + 2 meetings at DA)				Differences between GA and AA are: 6 times less attendant at GA meetings on average, AA is 50 times larger than GA in total, AA meetings last 1–1.5h while GA meetings last 1-4h, One "gives therapy" in GA while one "shares" in AA, the primary advice give at GA meeting is financial, Working the steps holds a central place in AA while they do not in GA, Organization is pyramidal in GA while it is an inversed pyramid in AA, Gambling is the problem in GA while the problem is the self-centered self in AA	Medium

Table 4 (continued)

Authors	Methods		Participants				Main result	Quality
	Setting of recovery	Study design	Total sample age (Male)	Mean age ± SD	Country	Length of recovery		
Ferentzy et al. (2004) [80]	GA	Participant Observation and interviews	Participant Observation = 42 GA meetings; Interviews = 23 (62.5%)		Canada		GA has changed significantly over 1990–2005. The number of women in the Toronto area now stands at possibly 20% and rising, war stories no longer predominate, it is more focused on the 12 Steps and members are now encouraged to discuss emotions and life issues	Medium
Ferentzy et al. (2006) [81]	GA	Participant Observation and interviews	Participant Observation = 42 GA meetings; Interviews = 23 (62.5%)		Canada		There has been change in GA: A greater focus on emotional and life issues sharing, a greater involvement of women, and a larger focus on the 12-steps	Medium

Table 4 (continued)

Authors	Methods		Participants				Main result	Quality
	Setting of recovery	Study design	Total sample age (Male)	Mean age ± SD	Country	Length of recovery		
Straus (2006) [82]	GA	Survey, phone interview	Survey = 52; Interview = 12		USA	Clean time of 3.5 years on average	The process of GA members addressing one another directly during GA meetings (making comments) is identified as a unique aspect of GA compared to other TSMH groups. Despite a few misgivings by some members, overall comments were considered beneficial by members with respect to support for not gambling and insight into ''characterological issues'' (p. 75)	Low
Ferentzy et al. (2009) [83]	GA	Interviews	39 (67%)	56.5	Canada		GA members will often be well into the fourth and ninth steps before having given much thought to the other steps (with the exception of the first step, which involves an admission that one has a serious problem)	Medium

Table 4 (continued)

Authors	Methods		Participants				Main result	Quality
	Setting of recovery	Study design	Total sample age (Male)	Mean age ± SD	Country	Length of recovery		
Ferentzy et al. (2010a) [84]	GA	Interviews	39 (67%)	56.5	Canada		Overcoming both self-centeredness and feelings of entitlement is key in GA recovery process. The Serenity Prayer plays a powerful role in the lives of many GA members—regardless of whether or not they believe in the "God" it invokes	Medium
Ferentzy et al. (2010b) [85]	GA	Interviews	39 (67%)	56.5	Canada		GamAnon comprises mostly women—spouses of male GA members—who traditionally have taken a keen interest in the ways in which their husbands achieve and maintain abstinence from gambling. Changing spousal roles have led to fewer women joining GamAnon, as many opt instead to part with troubled spouses. As well, more women are attending GA than in the past, typically with husbands who are disinclined to join GamAnon	Medium

Table 4 (continued)

Authors	Methods		Participants				Main result	Quality
	Setting of recovery	Study design	Total sample age (Male)	Mean age ± SD	Country	Length of recovery		
Avery & Davis (2008) [86]	GA	Survey	136 (0%)	-	USA	Early recovery	Women reported that when attending GA meetings, they felt welcomed and understood by individuals experiencing the same problems, no longer felt alone, felt they could tell the truth, and that ''meetings instilled hope that problems could be solved'' (p. 181). However, some participants indicated that they felt unwelcome at GA meetings because of being a woman. Moreover, issues with how GA emphasized abstinence and finding the group to be ''unsympathetic'' were also reported	Medium

Table 4 (continued)

Authors	Methods		Participants				Main result	Quality
	Setting of recovery	Study design	Total sample age (Male)	Mean age ± SD	Country	Length of recovery		
Laracy (2011) [87]	GA	Participant observation; interview	Interview = 12 (58%)	37–66	Canada		For current members, most participants felt they were unable to discuss their gambling issues with family and friends, and that GA provided a safe forum ‘‘for self-disclosure and discussion’’ (p. 121) as other members shared similar experiences. Past members’ indicated that they no longer attended GA meetings due to the religious undertones of the program, while others indicated that identifying as a ‘‘compulsive gambler’’ for the rest of their lives was not a positive approach to recovery	High

Table 4 (continued)

Authors	Methods		Participants				Main result	Quality
	Setting of recovery	Study design	Total sample age (Male)	Mean age ± SD	Country	Length of recovery		
Ševčíková et al. (2018) [88]	SA, Sex Addicts Anonymous	Interview	18 (94%)	37.22	Republic Czech, Slovakia		Members found it essential to deal with the many manifestations of excessive internet use for sexual purposes in ways that corresponded to the criteria of behavioral addiction. One crucial criteria of behavioral addiction—tolerance—was not explicitly taken into consideration in the recovery process	High
Fernandez et al. (2021) [89]	Sex and Love Addicts Anonymous	Interview	14 (93%)	43.86 ± 11.23	United Kingdom	Attended at least six group meetings	Recovery experiences included 5 themes: (i) unmanageability of life as impetus for change, (ii) addiction as a symptom of a deeper problem, (iii) recovery is more than just abstinence, (iv) maintaining a new lifestyle and ongoing work on the self, and (v) the gifts of recovery	High
Vogel et al. (1998) [90]	DTR	Mixed-method, Cross-sectional study, Semi-structured interview	Semi-structured interviews = 8 (75%)		USA		DTR provide a safe forum where members feel accepted and are able to discuss both their addictions and their psychiatric disabilities	Low

Table 4 (continued)

Authors	Methods		Participants				Main result	Quality
	Setting of recovery	Study design	Total sample age (Male)	Mean age ± SD	Country	Length of recovery		
Matusow et al. (2013) [91]	DTR	Focus groups	31		USA	Exposure to DTR ranged from 2 weeks to 2.5 years	Participants emphasized that in linking them to others with similar problems, the DTR groups played a vital emotional role in their lives and provided a needed venue for information sharing that might have been otherwise unavailable	High
Hagler et al. (2015) [92]	DTR	Focus groups	15 (53%)	47.86 ± 6.27	USA		Relative to other mutual-help groups in which participants reported feeling ostracized because of their dual diagnoses, participants reported that it was beneficial to learn about dual disorders in a safe and accepting environment	High

Table 4 (continued)

Authors	Methods		Participants				Main result	Quality
	Setting of recovery	Study design	Total sample age (Male)	Mean age ± SD	Country	Length of recovery		
Amorelli et al. (2019) [93]	Amputees Unanimous (AU, an in-house group)	Focus groups	17 (88%)		USA	Time since amputation: From 0 months to + 3 years	Drawbacks of AU: AU's link to AA may be viewed negatively. Perception that limb loss was due to personal choices. Suggested modifications for AU: Lessen dialogue on "spirituality", Condense and simplify steps/behaviors, Utilize "person with limb loss" versus "amputee" language, Rephrase specific content to reflect positivity	High

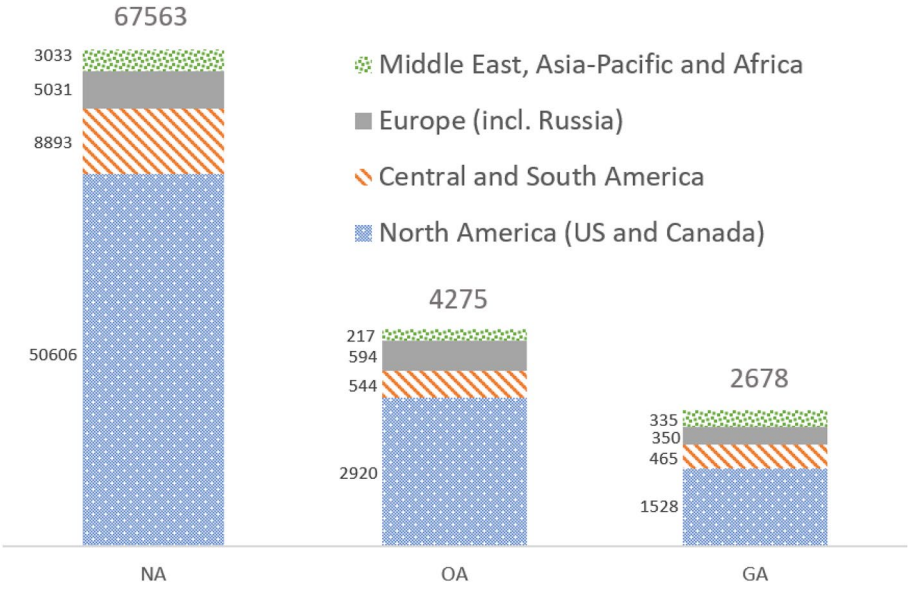

Fig. 7 Breakdown of face-to-face meetings by geographical area, for NA, OA and GA. Other kind of TSMH groups are not included in this figure as the required information was not available online

as intrinsically separated from its surroundings, and from experiences of well-being, safety and worth; and (ii) leads individuals to search for external sources to fill up this perceived lack. The 6 components inherent in any form of addiction [29] can be found in ontological addiction [108]. Significant correlations were found between ontological addiction and depressive symptoms ($r = 0.537$), anxiety symptoms ($r = 0.565$) and self-esteem ($r = 0.426$ [108];). Ontological addiction is at the root of the suffering of mental unsatisfaction, and thus at the root of the suffering experienced by subjects with psychiatric disorders and addictions. Only the form taken by the incorrect self-concept endorsing ontological addiction changes with the addiction.

By opposition to an incorrect self-concept, a correct self-concept conceives of itself as inseparable from others, from its surroundings and from its own experiences of well-being, safety and worth. Curing one's ontological addiction means to progressively change the self-concept from incorrect to correct. TSMH groups can be advantageous to that regards by providing a space in which (i) People can feel as a part of whole (feeling of connectedness with the group members); (ii) People can progressively start identifying themselves to a helper by providing emotional support and advises. Through the process of changing one's self-concept from incorrect to correct, the perception one's have of characteristics inherent to the psychiatric disorder goes from weakness to strength. If designed properly, TSMH groups can help individuals to use these characteristics both to serve's oneself and others instead of using them for self-destruction. Future research should evaluate the efficacy of TSMH groups coupled to 3rd wave CBT to reduce ontological addiction as well as more traditional kind of addictions.

Future TSMH groups could also get inspiration from the neurodiversity's concept [110]. This concept has helped to favor a positive view of individuals with e.g. autism, attention deficit hyperactivity disorder, dyslexia, depression, anxiety, intellectual disabilities, schizophrenia [111], or stuttering [112]. In the case of individuals with autism, the ability to hyperfocus, attention to detail, good memory, and creativity, as well as honesty, loyalty, and empathy for animals or for other autistic people can be conductive to success for the whole work team, if they are appropriately balanced by consideration of relevant individual weaknesses ([113, 114]). As for individuals with borderline personality disorder, altruism, self-derision, creativity, enthusiasm and probity can be a great asset in any group, provided that the disorder is treated correctly [115].

Limitations

In addition of the limitations discussed previously in Sect. "Discussion", the main limits of this study must be emphasized. They are caused by:

- The method applied (see Sect. "Methods")**.** The eligibility criteria led to exclude papers focusing on (i) Mutual help groups which are not 12 step based, such as SMART ([116, 117]), Seeking Safety ([118, 119]) or Compassionate Friends [120]; (ii) Online or remote TSMH group meetings, which hold a large potential for improving healthcare continuity and access [121, 122] even though they may be less effective than face-to-face meetings in fostering solidarity and sense of belonging [128]. Besides, additional databases such as Web of Science or Science Direct could

have been explored. Efforts were made to limit this bias by systematically checking the references of papers.

- The meta-analysis objective (see Sect. "Quantitative studies")**.** The pooled effect is correlational, which precludes the ability for causal conclusions. In other words, it is unclear whether e.g. lower severity of symptoms is an outcome of duration in TSMH. Another possibility is that subjects with lower severity of symptoms fell less stigmatized and hence are more keen to seek help and attend TSMH meetings. One RCT and one cross-sectional study showed a causal relationship, from higher attendance to lower severity of symptoms ([53, 64]). More longitudinal studies are yet needed to bidirectional associations over time between TSMH participants.
- The pooled samples. Among the 4 meta-analysis performed, pooled mean age ranges from 36.5 to 40.5, and 90–81% of pooled subjects were male. Many of the pooled subjects come from countries with a moderate to strong religious history. No study were found on TSMH of people living in Central and South America, while 13% of face-to-face GA, NA and OA meetings are hold there (see Fig. 7).

Conclusions

TSMH attendance and involvement were negatively correlated with severity of symptoms (high and medium levels of evidence) and positively correlated with quality of life (low levels of evidence). It is important to acknowledge that all TSMH have limitations and have been subject to criticism. The question is whether the benefits outweigh the potential risks. Our primary argument is that the answer to this question will depend on proper assessment and classification of the individual, as well as the type of TSMH engaged, and what other treatment services are being received. To reduce potential risks and improve efficacy, we advocate that TSMH group targeting ontological addiction, coupled with third wave CBT, is a promising direction.

Appendix A

See Table 5.

Appendix B

See Table 6.

Appendix C

See Fig. 7.

Appendix D

See Table 7.

Appendix E

See Tables 8 and 9.

Table 5 Names of the 28 TSMH groups that were searched for inclusion in the databases presented in Sect. "Search strategy and selection criteria". We used quotation marks so as to search for the exact expression in databases and register

TSMH group
Addictions victorious and all addictions anonymous
Clutterers anonymous
Co-dependents anonymous
CoSex and love addicts anonymous
Debtors anonymous
Dual recovery anonymous
Emotions anonymous
Families anonymous
Food addicts anonymous
Food addicts in recovery anonymous
Gam-anon/gam-a-teen
Gamblers anonymous
Heroin anonymous
Marijuana anonymous
Nar-Anon
Narcotics anonymous
Nicotine anonymous
Online gamers anonymous
Overeaters anonymous
Pills anonymous
Sex addicts anonymous
Sex and love anonymous
Sexaholics anonymous
Sexual compulsives anonymous
Sexual recovery anonymous
Survivors of incest anonymous
Underearners anonymous
Workaholic anonymous

Table 6 steps followed by major TSMH groups

	AA (Alcoholics Anonymous)	NA (Narcotics Anonymous)	Overeaters Anonymous (OA)	Gamblers Anonymous (GA)	Sexaholics Anonymous (SA)	Double Trouble in Recovery (DTR)
1	We admitted we were powerless over alcohol—that our lives had become unmanageable	We admitted that we were powerless over our addiction, that our lives had become unmanageable	We admitted we were powerless over food, that our lives had become unmanageable	We admitted we were powerless over gambling, that our lives had become unmanageable	We admitted that we were powerless over lust, that our lives had become unmanageable	We admitted we were powerless over mental disorders and substance abuse, that our lives had become unmanageable
2	Came to believe that a Power greater than ourselves could restore us to sanity	Came to believe that a Power greater than ourselves could restore us to sanity	Came to believe that a Power greater than ourselves could restore us to sanity	Came to believe that a Power greater than ourselves could restore us to a normal way of thinking and living	Came to believe that a Power greater than ourselves could restore us to sanity	Came to believe that a Power greater than ourselves could restore us to sanity
3	Made a decision to turn our will and our lives over to the care of God as we understood Him	Made a decision to turn our will and our lives over to the care of God as we understood Him	Made a decision to turn our will and our lives over to the care of God as we understood Him	Made a decision to turn our will and our lives over to the care of this Power of our own understanding	Made a decision to turn our will and our lives over to the care of God as we understood Him	Made a decision to turn our will and our lives over to the care of God as we understood Him
4	Made a searching and fearless moral inventory of ourselves	Made a searching and fearless moral inventory of ourselves	Made a searching and fearless moral inventory of ourselves	Made a searching and fearless moral and financial inventory of ourselves	Made a searching and fearless moral inventory of ourselves	Made a searching and fearless moral inventory of ourselves
5	Admitted to God, to ourselves and to another human being the exact nature of our wrongs	Admitted to God, to ourselves, and to another human being the exact nature of our wrongs	Admitted to God, to ourselves and to another human being the exact nature of our wrongs	Admitted to ourselves and to another human being the exact nature of our wrongs	Admitted to God, to ourselves, and to another human being the exact nature of our wrongs	Admitted to God, to ourselves and to another human being the exact nature of our wrongs
6	Were entirely ready to have God remove all these defects of character	Were entirely ready to have God remove all these defects of character	Were entirely ready to have God remove all these defects of character	Were entirely ready to have these defects of character removed	Were entirely ready to have God remove all these defects of character	Were entirely ready to have God remove all these defects of character
7	Humbly asked Him to remove our shortcomings	Humbly asked Him to remove our shortcomings	Humbly asked Him to remove our shortcomings	Humbly asked God (of our understanding) to remove our shortcomings	Humbly asked Him to remove our shortcomings	Humbly asked Him to remove our shortcomings
8	Made a list of all persons we had harmed, and became willing to make amends to them all	Made a list of all persons we had harmed, and became willing to make amends to them all	Made a list of all persons we had harmed, and became willing to make amends to them all	Made a list of all persons we had harmed and became willing to make amends to them all	Made a list of all persons we had harmed, and became willing to make amends to them all	Made a list of all persons we had harmed and became willing to make amends to them all
9	Made direct amends to such people wherever possible, except when to do so would injure them or others	Made direct amends to such people wherever possible, except when to do so would injure them or others	Made direct amends to such people wherever possible, except when to do so would injure them or others	Make direct amends to such people wherever possible, except when to do so would injure them or others	Made direct amends to such people wherever possible, except when to do so would injure them or others	Made direct amends to such people whenever possible, except when to do so would injure them or others
10	Continued to take personal inventory and when we were wrong promptly admitted it	Continued to take personal inventory and when we were wrong promptly admitted it	Continued to take personal inventory and when we were wrong, promptly admitted it	Continued to take personal inventory and when we were wrong, promptly admitted it	Continued to take personal inventory and when we were wrong, promptly admitted it	Continued to take personal inventory and, when we were wrong, promptly admitted it

Table 6 (continued)

	AA (Alcoholics Anonymous)	NA (Narcotics Anonymous)	Overeaters Anonymous (OA)	Gamblers Anonymous (GA)	Sexaholics Anonymous (SA)	Double Trouble in Recovery (DTR)
11	Sought through prayer and meditation to improve our conscious contact with God as we understood Him, praying only for knowledge of His will for us and the power to carry that out	We sought through prayer and meditation to improve our conscious contact with God as we understood Him, praying only for knowledge of His will for us and the power to carry that out	Sought through prayer and meditation to improve our conscious contact with God as we understood Him, praying only for knowledge of His will for us and the power to carry that out	Sought through prayer and meditation to improve our conscious contact with God as we understood Him, praying only for knowledge of His will for us and the power to carry that out	Sought through prayer and meditation to improve our conscious contact with God as we understood Him, praying only for knowledge of His will for us and the power to carry that out	Sought through prayer and meditation to improve our conscious contact with God as we understood Him, praying only for knowledge of His will for us and the power to carry that out
12	Having had a spiritual awakening as the result of these steps, we tried to carry this message to alcoholics and to practice these principles in all our affairs	Having had a spiritual awakening as a result of these steps, we tried to carry this message to addicts, and to practice these principles in all our affairs	Having had a spiritual awakening as the result of these Steps, we tried to carry this message to compulsive overeaters and to practice these principles in all our affairs	Having made an effort to practice these principles in all our affairs, we tried to carry this message to other compulsive gamblers	Having had a spiritual awakening as the result of these Steps, we tried to carry this message to sexaholics, and to practice these principles in all our affairs	Having had a spiritual awakening as the result of these steps, we tried to carry this message to other dually-diagnosed people and to practice these principles in all our affairs

Differences are highlighted in red

Table 7 Details on main TSMH groups

	Alcoholics Anonymous (AA)	Narcotics Anonymous (NA)	Overeaters Anonymous (OA)	Gamblers Anonymous (GA)	Sexaholics Anonymous (SA)	Double Trouble in Recovery (DTR)
Date of foundation	1935	1953	1960	1957	1979	1989
Number of members	2,000,000		60,000			–
Number of countries where present	180	143	77	75	69	1 (USA)
Number of meetings (% of face to face meetings)	123,000	76,000 (89%)	7,146 (60%)	2,942 (91%)	–	200
Abstinence definition	Complete and continuous abstinence from all alcohol	Complete and continuous abstinence from all drugs	The action of refraining from compulsive eating and compulsive food behaviors while working towards or maintaining a healthy body weight	Complete and continuous abstinence from gambling	For married members: no form of sex with self or with persons other than the spouse For unmarried persons: Freedom from sex of any kind	No precise definition of abstinence
Requirement for membership	Desire to stop drinking	Desire to stop using drugs	Desire to stop eating compulsively	Desire to stop gambling	Desire to stop lusting and become sexually sober	No formal requirement

Sources: [123–128]. To get more information on SA, all country dependent SA sub-groups were contacted by email one time. The answer of the main SA office (SAICO) was: "We are in the process of conducting a census this year and will have a better idea next year [2023]."

Table 8 Scoring criteria for the quality assessment of individual quantitative studies

Criteria	Scale name	Detailed description of questions relevant to this report	Scoring
C1	Clear description of research question	C1a. Was the specific independent variable(s) identified? C1b. Was the dependent variable(s) clearly indicated? C1c. Were hypotheses clearly stated? C1d. Were the target population and setting specified?	+ Φ − + Φ − + Φ − + Φ −
C2	Sampling selection free from bias	Grading according to: Randomly sampled from defined population (+), Stratified sampling from a defined population (+), Cluster sampling (Φ), Convenience sampling (Φ), Unclear (−)	+ Φ −
C3	Sampling adequately described (Originally: Sample selection free from bias, see C2)	C3a. Were inclusion/exclusion criteria specified (e.g., risk, diagnostic criteria), and with sufficient detail and without omitting criteria critical to the study? C3b. Were criteria applied equally to all study groups? C3c. Were health, demographics, and other characteristics of subjects described?	+ Φ − + Φ − + Φ −
C4	Comparable study groups	Were concurrent controls used? (Concurrent preferred over historical controls.) Given if sampled concurrently C4 for cohort study or cross-sectional study: Were groups comparable on important confounding factors and/or were preexisting differences (e.g., age, BMI, SES)	+ Φ − + Φ −
C5	Participants withdrawals or response rate described	C5a. Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? C5b. Were all enrolled subjects/patients (in the original sample) accounted for? If not, was their exclusion comprehensible? C5c. If group comparison: Were reasons for withdrawals similar across groups?	+ Φ − + Φ − + Φ −
C6	Appropriateness and clear description of data collection procedures	C6a. Was the approach appropriate for the research question? C6b. Was the sampling strategy appropriate for the research question? C6c. If cohort studies and cross-sectional studies, were study settings, and data collection procedures clearly described?	+ Φ − + Φ − + Φ −
C7	Clearly defined, valid, reliable outcomes of severity of symptoms	C7a. Were severity of symptoms measures appropriate to question and outcomes of concern? C7b. Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures? C7c. Are validity and reliability of the measure(s) mentioned? C7d. Were other factors accounted for (measured) that could affect outcomes? C7e. Were the measurements conducted consistently across groups?	+ Φ − + Φ − + Φ − + Φ − + Φ −
C8	Score reliability estimate given for severity of symptoms	Are score reliability estimates given for severity of symptoms? (Grading according to: any estimate from current sample (+), any estimate from another study (Φ), None given (−))	+ Φ −
C9	Clearly defined, valid, reliable outcomes of quality of life	C9a. Were quality of life measures appropriate to question and outcomes of concern? C9b. Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures? C9c. Are validity and reliability of the measure(s) mentioned? C9d. Were other factors accounted for (measured) that could affect outcomes? C9e. Were the measurements conducted consistently across groups?	+ Φ − + Φ − + Φ − + Φ − + Φ −

Table 8 (continued)

Criteria	Scale name	Detailed description of questions relevant to this report	Scoring
C10	Score reliability estimate given for quality of life	Are score reliability estimates given for quality of life? (Grading according to: any estimate from current sample (+), any estimate from another study (Φ), None given (−))	+ Φ −
C11	Clearly defined, valid outcomes of 12-step mutual help group attendance and/or involvement	C11a. Were 12-step mutual help group attendance and/or involvement measures appropriate to question and outcomes of concern?	+ Φ − + Φ − + Φ −
		C11b. Were the observations and measurements based on standard, valid, and reliable data collection/ instruments/ tests/procedures?	+ Φ − + Φ −
		C11c. Are validity and reliability of the measure(s) mentioned?	
		C11d. Were other factors accounted for (measured) that could affect outcomes?	
		C11e. Were the measurements conducted consistently across groups?	
C12	Appropriate statistical analysis	C12a. Were statistical analyses adequately described and the results reported appropriately?	+ Φ − + Φ −
		C12b. Were correct statistical tests used and assumptions of test not violated?	+ Φ − + Φ −
		C12c. Were statistics reported with levels of significance and/ or confidence intervals (added) and/or effect size?	+ Φ −
		C12d. Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	
		C12e. If negative findings, was a power calculation reported to address type 2 error?	
C13	Conclusions supported by results	C13a. Is there a discussion of findings? *(Added: Are the claims made supported by sufficient evidence?)*	+ Φ − + Φ −
		C13b. Are biases and study limitations identified and discussed?	
C14	Unlikely funding bias	C14a. Were sources of funding and investigators' affiliations described?	+ Φ − + Φ −
		C14b. Was there no apparent conflict of interest?	

This is a modified set of the quality criteria for primary research as proposed by [31], adapted from [32]

As the association between TSMH group attendance and/or involvement and quality of life and/or severity of symptoms was not an objective of all included primary studies, the quality score was computed as the mean of responses across criteria that could be evaluated

+ Positive (= 2 points): Indicates that the report has clearly addressed these issues

Φ Neutral (= 1 point): Indicates that the presence of this criterion is ambiguous or that the report is neither exceptionally strong nor exceptionally weak

− Negative (= 0 points): Indicates that these issues have not been adequately addressed

Table 9 Quality assessment of individual quantitative studies

References	C1 Clear research question	C2 Sampling bias	C3 Sample description	C4 Comparable study groups	C5 Withdrawals/ response rates	C6 Data collection procedures	C7 Outcome severity of symptom	C8 Score reliability severity of symptoms	C9 Outcome quality of life[2]	C10 Score reliability quality of life	C11 Outcome TSMH[4]	C12 Statistics	C13 Conclusions	C14 Funding bias	Final score[1]
Azkhosh et al. (2016) [44]	2	1	2	2	2	2	N/A	N/A	2	2	N/A	2	1	2	1,79
Bogenschutz etal. (2013) [64]	2	1	2	2	2	2	2	0	N/A	N/A	2	2	2	2	1,75
Chen (2006) [41]	2	1	2	N/A	2	2	2	2	N/A	N/A	N/A	2	2	2	1,82
Cooper (2004) [50]	2	1	2	2	2	1	N/A	N/A	N/A	N/A	N/A	2	2	2	1,66
Efrati and Gola (2018) [57]	2	1	2	N/A	0	1	2	2	N/A	N/A	1	2	2	2	1,50
Galanter et al. (2013) [42]	2	1	2	N/A	0	1	2	2	N/A	N/A	1	2	2	2	1,55
Galanter et al. (2019) [45]	2	N/A	2	N/A	1	2	1	0	N/A	N/A	2	2	2	2	1,63
Gomes and Pascual-Leone (2009) [54]	2	1	2	N/A	1	2	2	2	N/A	N/A	2	2	2	2	1,82
Grant et al. (2011) [55]	2	1	2	2	0	2	2	0	2	0	N/A	2	2	2	1,39
Kriz (2002) [48]	2	1	1	1	1	2	1	2	N/A	N/A	2	2	2	2	1,51
Laudet et al. (2004) [59]	2	1	2	N/A	2	2	1	0	N/A	N/A	1	2	2	2	1,47
Magura et al. (2003) [21]	2	1	2	N/A	2	2	1	0	N/A	N/A	1	2	1	2	1,33
Magura et al. (2007) [60]	2	1	2	N/A	2	2	1	0	2	2	2	2	2	2	1,69
Magura, Rosenblum, et al. (2008) [62]	2	1	2	1	2	2	2	0	N/A	N/A	2	2	2	2	1,52
Magura, Villano, et al. (2008) [61]	2	1	1	N/A	0	2	N/A	N/A	N/A	N/A	1	2	2	2	1,37

Table 9 (continued)

References	C1 Clear research question	C2 Sampling bias	C3 Sample description	C4 Comparable study groups	C5 Withdrawals/ response rates	C6 Data collection procedures	C7 Outcome severity of symptom	C8 Score reliability severity of symptoms	C9 Outcome quality of life[2]	C10 Score reliability quality of life	C11 Outcome TSMH[4]	C12 Statistics	C13 Conclusions	C14 Funding bias	Final score[1]
Maton (1988) [46]	2	1	1	N/A	0	2	2	2	N/A	N/A	N/A	2	1	2	1,38
Maton (1989) [47]	2	1	2	2	2	2	2	0	N/A	N/A	1	1	2	2	1,49
Monico et al. (2015) [43]	2	1	2	N/A	1	2	1	0	N/A	N/A	1	2	2	2	1,33
Oei and Gordon (2008) [53]	2	1	1	N/A	0	2	2	1	N/A	N/A	2	2	2	2	1,49
Petry (2003) [49]	2	1	2	2	0	2	2	0	N/A	N/A	2	2	2	2	1,53
Petry et al. (2006) [50]	2	1	2	2	2	2	2	1	N/A	N/A	N/A	2	2	2	1,73
Petry et al. (2007) [52]	2	1	2	2	2	2	2	2	N/A	N/A	N/A	2	2	2	1,83
Rosenblum et al. (2014) [63]	2	1	2	2	2	2	2	0	2	2	1	2	2	2	1,70
Toumbourou et al. (2002) [40]	2	1	2	N/A	1	2	N/A	N/A	N/A	N/A	2	2	2	2	1,69
Wnuk and Charzyńska (2022) [58]	2	1	2	N/A	0	2	2	2	1	0	1	2	2	2	1,41
Wright (2010) [56]	2	1	2	N/A	1	2	1	0	N/A	N/A	1	2	2	0	1,25

[1]As all the included primary studies did not measure 12-step mutual help group attendance or involvement, quality of life and severity of symptoms, the final quality score was computed as the mean of responses across criteria that could be evaluated

[2]Quality of life or life satisfaction or well-being

[3]TSMH; 12-step mutual help group. Attendance (time in group, in number of sessions attended, or number of months), OR Involvement (e.g. sense of belonging, having a sponsor, being a sponsor, experiencing a spiritual awakening or conversion experience since getting involved in the group)

Appendix F

See Tables 10, 11, 12 and 13.

Table 10 Measures used in the studies used to assess the pooled correlation severity of symptom and duration in TSMH, and pearson correlation (and corresponding *p*-value) between those two

Authors	Setting of recovery	Country	Severity of symptoms	Duration in TSMH	Pearson correlation (*p*-value)
Toumbourou et al. (2002) [40]	NA	Australia	Marijuana use (retrospective interview)	Number of months of at least weekly attendance last year	− 0.38 ($p < 0.01$)
Wright (2010) [56]	Unspecified TSMH for CSBD	USA, Canada	Sexual compulsivity (6-point item Likert scale)	Meeting attendance (5-point item Likert scale)	− 0.35 ($p < 0.01$)
Laudet et al. (2004) [59]	DTR	USA	Substance use*	Number of months of attendance last year (less than weekly attendance was rare)	− 0.26 ($p < 0.05$)
Efrati & Gola (2018) [57]	SA	Israel	Severity of compulsive sexual behaviours (Individual-based CSB scale)	Number of months in SA	– 0.26 ($p < 0.05$)
Galanter et al. (2013) [42]	NA	USA	Level of cravings for substance (10-point visual analog scale)	Number of meetings last year (5-point item Likert scale)	− 0.21 ($p < 0.001$)
Galanter et al. (2019) [45]	NA	Iran	Level of cravings for substance (10-point visual analog scale)	Number of meetings last year (5-point item Likert scale)	− 0.144 ($p < 0.05$)
Wnuk and Charzyńska (2022) [58]	SA	Poland	Severity of compulsive sexual behaviours**	Number of months in SA	0.08 ($p = 0.46$)
Rosenblum et al. (2014) [63]	DTR	USA	Symptom checklist scale (SCL90)	Number of DTR meetings attended past 6 months	− 0.08 ($P = 0.485$)

*Proportion of months during which participants reported any substance use during the year, using the format of the Addiction Severity Index

**Sex Addiction Screening Test-Revised (SAST-R)

Table 11 Measures used in the studies used to assess the pooled correlation between severity of symptoms and duration in TSMH, and pearson correlation (and corresponding p-value) between those two

Authors	Setting of recovery	Country	Measure for severity of symptom	Measure for TSMH involvement	Pearson correlation (p-value)
Toumbourou et al. (2002) [40]	NA	Australia	Marijuana use	Highest step completed	− 0.33 ($p < 0,05$)
Efrati and Gola (2018) [57]	SA	Israel	Severity of compulsive sexual behaviours	Step number	− 0.4 ($p < 0.001$)
Galanter et al. (2013) [42]	NA	USA	Level of cravings for substance	NA beliefs (5-point item Likert scale)	− 0.266 ($p < 0.001$)
Galanter et al. (2019) [45]	NA	Iran	Level of cravings for substance	NA belief (5-point item Likert scale)	− 0.065 ($p > 0.05$)
Wnuk and Charzyńska (2022) [58]	SA	Poland	Severity of compulsive sexual behaviours	SA involvement	0.03 ($p > 0.05$)

For more details on the measures used, please refer to Table 10

Table 12 Measures used in the studies used to assess the pooled correlation between quality of life and duration in TSMH, and pearson correlation (and corresponding p-value) between those two

Authors	Setting of recovery	Country	Measure for severity of symptom	Measure for duration in TSMH	Pearson correlation (*p*-value)
Efrati and Gola (2018) [57]	SA	Israel	Well-being*	Number of months in SA	0.09 ($p > 0.05$)
Wnuk and Charzyńska (2022) [58]	SA	Poland	*Satisfaction with Life Scale (SWLS)*	Number of months in SA	0.06 ($p = 0.5872$)
Rosenblum et al. (2014) [63]	DTR	USA	Retrospective Quality of Life Scale (RQQL)	DTR meetings attended past 6 month	0.14 ($P = 0.21$)

(*) One measure of the Mental Health Index (MHI-5), which is a subscale of the RAND SF-36 Quality of Life Scale

Table 13 Measures used in the studies used to assess the pooled correlation between quality of life and TSMH involvement, and pearson correlation (and corresponding p-value) between those two

Authors	Setting of recovery	Country	Measure for severity of symptom	Measure for duration in TSMH	Pearson correlation (p-value)
Efrati and Gola (2018) [57]	SA	Israel	Well being	Step number	0.29 ($p < 0.01$)
Wnuk and Charzyńska (2022) [58]	SA	Poland	Satisfaction with life	SA involvement	0.44 ($p < 0.001$)
Magura et al. (2007) [60]	DTR	USA	Quality of life/leisure time	DTR affiliation	0.15 ($p < 0.01$)

For more details on the measures used, please refer to Table 10 and 12

Author contributions ML drafted the manuscript, performed the data collection process, analyzed the risk of bias of all included papers and led the meta-analyses. DD evaluates the risk of bias of the 8 studies included in the meta-analysis. DD, PC and EO supervised ML throughout all the process by providing advises and feedbacks. All authors contributed critically to the text and all approved the final version of the manuscript.

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Data availability Data are available upon request by email to the corresponding author.

Declarations

Conflict of interest ML, DD, PC and EO declare no conflict of interest.

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