



Drop-out from addiction treatment: A systematic review of risk factors



Hanne H. Brorson ^{a,*}, Espen Ajo Arnevik ^{a,b}, Kim Rand-Hendriksen ^{c,d}, Fanny Duckert ^a

^a Department of Psychology, University of Oslo, Norway

^b Department of Addiction Treatment, Oslo University Hospital, Norway

^c Health Services Research Centre, Akershus University Hospital, Lørenskog, Norway

^d Department of Health Management and Health Economics, University of Oslo, Norway

HIGHLIGHTS

- We review two decades of research on drop-out risk factors using box-score approach.
- Risk factors: Cognitive deficit, low alliance, personality disorder, and young age.
- Research on simple demographic risk factors should be discontinued.
- Clinical focus should be on identifying high-risk patients and monitoring alliance.

ARTICLE INFO

Article history:

Received 28 January 2013

Received in revised form 13 June 2013

Accepted 17 July 2013

Available online 31 July 2013

Keywords:

Drop-out

Addiction

Treatment

Risk factor

Prediction

Review

ABSTRACT

Completion of addiction treatment is one of the most consistent factors associated with a favorable treatment outcome. Unfortunately, it is more common for a patient to drop-out of addiction treatment than to complete the treatment. To prevent drop-out, risk factors must be identified. This box-score review focuses on studies investigating the risk factors associated with drop-out from addiction treatment published in peer-reviewed journals from 1992 to 2013. A total of 122 studies involving 199,331 participants met the inclusion criteria. Contrary to recommendations from previous reviews, 91% of the included studies focused primarily on enduring patient factors, mainly demographics. The most consistent risk factors across the different study designs, samples, and measurement methods were cognitive deficits, low treatment alliance, personality disorder, and younger age. With the exception of younger age, none of the demographic factors emerged as consistent risk factors. Further research on the relationship between simple demographic factors and drop-out risk is of limited value. However, little is known about the potential risk factors related to treatment programs and to the treatment processes. Based on the review, clinical recommendations include assessing cognitive functioning and personality disorders at baseline and continuous monitoring of treatment alliance.

© 2013 Elsevier Ltd. All rights reserved.

Contents

1.	Introduction	1011
2.	Method	1012
	2.1. Search strategy	1012
	2.2. Exclusion criteria	1012
	2.3. Description of the studies	1013
	2.4. Extraction of data	1013
	2.5. Analysis	1015
3.	Results	1015
	3.1. Patient factors	1015
	3.1.1. Age	1015
	3.1.2. Sex	1015
	3.1.3. Education	1015
	3.1.4. Substance use	1015

* Corresponding author at: Department of Psychology, University of Oslo, Mailbox 1094 Blindern, 0317 Oslo, Norway. Tel.: +47 466 63 454.
E-mail address: h.h.brorson@psykologi.uio.no (H.H. Brorson).

3.1.5.	Co-occurring disorder	1015
3.1.6.	Marital status	1016
3.1.7.	Cognitive functioning	1016
3.2.	Treatment factors	1016
3.2.1.	Treatment method	1016
3.2.2.	Treatment setting	1016
3.2.3.	Treatment duration	1016
3.2.4.	Patient/staff-ratio	1016
3.3.	Treatment process factors	1016
3.3.1.	Motivation	1016
3.3.2.	Alliance	1016
3.3.3.	Treatment satisfaction	1016
3.4.	Interactions	1016
4.	Discussion	1016
4.1.	Patient factors	1016
4.2.	Treatment factors	1019
4.3.	Treatment process factors	1019
4.4.	Interactions	1019
4.5.	Methodological considerations	1020
4.6.	Limitations	1020
5.	Conclusion and implications	1020
5.1.	Implications for practice	1020
5.2.	Implications for research	1020
	Acknowledgments	1021
	References	1021

1. Introduction

The global population has reached 7 billion people, and numbers from the UN World Drug Report (2012) suggests that of these, 230 million people use illegal drugs at least once a year; 27 million people are addicted; 11.8 million people suffered a moderate to severe disability attributable to illegal drug use, and more than 0.2 million people die from drug use every year. The numbers on death and disability linked to alcohol are even higher, and a WHO study (Mathers et al., 2009) reports that alcohol use disorders are responsible for the death of 2.3 million people and the disability for some 40.5 million people every year. To counteract the global challenge of drug and alcohol use disorders, different addiction treatments have been, and are being, developed. Broadly defined, addiction treatment is a planned, goal-directed change process (Walker, 2009), aimed at reducing substance abuse or achieving abstinence, preventing or reducing the frequency and severity of relapse, and improving adaptive functioning (APA, 2007). The treatment is delivered in many different settings, using a variety of psychological, pharmacological and social approaches (Landry, 1996), and may last from a few months to several years depending on the individuals needs and availability of resources (APA, 2007).

One of the most consistent factors related to favorable outcomes across all addiction treatments is treatment completion (Dalsbø et al., 2010). Treatment completion is associated with abstinence, lower crime rate (APA, 2007), fewer relapses, and higher levels of employment (Stark, 1992). However, failure to complete treatment, often referred to as *drop-out*, is common. Recent studies on the topic report of drop-out ranging from 21.5 to 43% in detoxification (Gilchrist, Langohr, Fonseca, Muga, & Torrens, 2012; Specka, Buchholz, Kuhlmann, Rist, & Scherbaum, 2011), 23–50% in outpatient treatment (McHugh et al., 2013; Santonja-Gómez et al., 2010), 17–57% in inpatient treatment (Deane, Wootton, Hsu, & Kelly, 2012; Samuel, LaPaglia, Maccarelli, Moore, & Ball, 2011), and 32–67.7% in substitution treatment (Lin et al., 2013; Smyth, Fagan, & Kernan, 2012). The outcome of patients after they drop-out of addiction treatment is unfavorable compared to those who complete treatment. Several studies show an increased risk of relapse, legal and financial difficulties, poor health, and readmission associated with dropping out (Alterman et al., 1996;

Brewer, Catalano, Haggerty, Gainey, & Fleming, 1998; Moos, Pettit, & Gruber, 1995; Stark, 1992). Additionally, drop-out comes with a high cost to society in terms of undermining treatment effectiveness (Simpson, 1979), contributing to crime, spreading HIV (UNODC, 2012), and causing a great deal of pain to loved ones.

Although drop-out is not unique to addiction treatment, the consequences are more severe compared to drop-out from general psychotherapy. Previous investigations of the dose–response relationship in psychotherapy suggest that therapeutic benefits occur early in treatment and increase more slowly at higher dosage levels (Hansen & Lambert, 2003; Howard, Kopta, Krause, & Orlinsky, 1986). Approximately 25% of patients improve after one session, and 50% improve by 8 sessions (Howard et al., 1986). These numbers suggest that patients who drop out of general psychotherapy after only a few sessions may still obtain a positive treatment outcome. Contrary to the dose–response relationship in general psychotherapy, patients leaving addiction treatment within three months showed no significant improvement (Eaton, 2004; Hawkins, Baer, & Kivlahan, 2008; Simpson, 1981). These results may suggest that patients in addiction treatment are less likely to achieve a positive treatment outcome during early phases of treatment. Successful outcome (e.g., reduction or cessation of drug use) increases linearly with the length of stay for patients in addiction treatment for more than three months (Simpson, 1979). With drop-out rates commonly exceeding 50% within the first month of treatment (Stark, 1992), most substance abusing patients are neither receiving adequate exposure to treatment, nor do they recover from their addiction. Thus, being able to help patients stay in addiction treatment has important clinical ramifications with wide ranging consequences for the addicted individual, his/her loved ones and society at large.

Accordingly, drop-out from addiction treatment has been a keen focus of research, culminating in several hundreds of studies. According to Baekeland and Lundwall's (1975) extensive review, 362 studies published between 1949 and 1973 included analyses of drop-out from psychotherapy, addiction treatment, and treatment for medical conditions. The review identified a large number of correlates of dropping out from addiction treatment, including several patient factors (e.g., younger age, female gender, socially isolated, lower socioeconomic status and motivation, more advanced stages of alcoholism, a history of

crime, and personality disorder) and treatment factors (e.g., court mandate, outpatient treatment setting, and drug-free treatment program and therapist qualities such as permissive, introverted and detached). Craig (1985) identified 40 studies for his review on drop-out from addiction treatment and psychiatric units between 1977 and 1983. He concluded that research on patient factors had not provided the necessary information to make decisions and interventions to counteract drop-out from addiction treatment. Craig (1985) claimed that the interaction between the patient and the treatment program had a greater impact on drop-out than patient factors, and he encouraged staff to take a look in the mirror. Stark (1992) located approximately 80 studies of drop-out from addiction treatment published between 1975 and 1990. He concluded that dropping out of addiction treatment was associated with several patient factors (e.g., being younger, social isolation, lower socioeconomic status, lower motivation, client expectations, criminal history, more prior treatment attempts, personality disorder, depression, and psychiatric severity) and treatment factors (e.g., longer treatment duration, drug-free treatment program, court mandate, and matching characteristics of patient and therapist). The most stable findings across these three reviews are the inconsistencies among correlates of addiction treatment drop-out, the high variability in drop-out rates across different treatment modalities and programs employing similar treatment methods, and the significant relationship between drop-out and anti-social personality disorder.

The previous reviews, however, are limited by their lack of systematic methods, such as pre-set eligibility criteria, systematic searches, assessment of the validity of the findings, and a systematic presentation of the key characteristics and findings of the included studies. Such reviews leave the reader generally unable to replicate the findings or to assess the likelihood of bias in any part of the review process. Systematic reviews have been described as providing more reliable findings from which conclusions can be drawn and decisions can be made (Oxman & Guyatt, 1993).

After Stark's review (1992), numerous studies of drop-out from addiction treatment have been published. A search of studies published between 1992 and 2013 revealed 122 unique studies that directly explore drop-out from addiction treatment, but to the best of our knowledge, there is no current review on the topic. The purpose of most studies is to provide healthcare decision makers and clinicians with useful guidance to prevent drop-out. However, conflicting results cause difficulties. For example, in their study of depression and early drop-out from substance use treatment, Curran, Kirchner, Worley, Rookey, and Booth (2002) conclude that "Results indicate that severe depressive symptomatology presenting at treatment entry is a significant risk factor for early attrition". A contradicting conclusion came from Levin et al. (2004), stating "Individuals with depression and/or anxiety were substantially less likely to drop out of treatment early". Without a systematic review highlighting these types of conflicting findings, health care decision makers are unlikely to discover such an evident disagreement between recent research findings.

The primary purpose of this systematic review is to conduct a comprehensive and clinically oriented evaluation of the available research regarding predictors of drop-out from addiction treatment. Three questions were of particular interest: (i) To date, most research has conceptualized risk factors for drop-out of addiction treatment as being relatively enduring patient characteristics (Hawkins et al., 2008), and several studies confirm this notion (Claus & Kindleberger, 2002; McKellar, Kelly, Harris, & Moos, 2006). Thus, the first question was: Is it possible to reliably predict *who* is likely to drop-out of addiction treatment based on available research? (ii) Substantial variations in drop-out rates point to the importance of treatment factors. Studies show that patients attending the poorest performing treatment programs are 7.1 times more likely to drop out early than those attending the best programs (Stevens, Radcliffe, Sanders, & Hunt, 2008). Thus, the second question was: What treatment factors increase the risk of

patients dropping out? (iii) A small, yet promising quantity of research literature has focused on treatment process factors (Hawkins et al., 2008). These are factors resulting from the dynamic interplay between the patient and the treatment program. Thus, the last question was: How successful are these factors at reliably predicting drop-out from addiction treatment?

2. Method

This systematic review was performed in accordance with the PRISMA guidelines (Moher, Liberati, Tetzlaff, & Altman, 2009), except from items referring to meta-regression.

2.1. Search strategy

To develop an adequate search query, we used a two stage procedure. In the first stage, we conducted a preliminary search using MEDLINE and PsychINFO. Based on the resulting 38 studies, we identified relevant search terms. Next, we designed a search string using drop-out terms and phrases identified through the preliminary search (drop-out* OR drop out* OR Attrition* OR AMA OR Against medical advice* OR Premature cessation* OR Premature termination* OR Non-compliance* OR Non-compliant*, OR Voluntary discharge* OR Treatment withdraw* OR Treatment refusal* OR Treatment discontinuation*). However, phrases and terms referring to drop-out are frequently used in relation to medical trials, treatment in general and educational research. We further refined the search query with specific and generic terms referring to drugs typical of substance abuse (Drug* OR Substance* OR Heroin* OR Opioid* OR Cannabis* OR Marijuana* OR Cocaine* OR Crack* OR Amphetamine* OR Methamphetamine* OR Hallucinogen*). We were only interested in drug and alcohol treatment settings (ie., no alcohol only treatments). By only using search terms referring to drugs, studies examining both drugs and alcohol would be identified, while alcohol only studies would be left out. As the scope of this review is limited to the *prediction* of drop-out from addiction treatment, a third group of search terms referring to prediction (Predict* OR Precursor* OR Antecedent*) was included. The search query still produced too many irrelevant results. We then decided to include entries descriptive of the study setting we were interested in, namely treatment or rehabilitation (treat* OR rehab*). We were able to apply the same search string unchanged in the seven databases we performed the search in: PsychINFO, MEDLINE, Embase, ERIC, Sociological Abstracts, Cochrane and ISI Web of Science (19. of April, 2013).

2.2. Exclusion criteria

1. Studies using drop-out terms to refer to phenomena other than what can be described as "premature discontinuation of treatment". Studies were excluded based on the drop-out term, because more stringent operationalization criteria would have ruled out many of the included studies due to heterogeneity and inexplicitness.
2. Studies without drop-out terms (those included in our search query) in the title, abstract or keywords.
3. Studies written in language other than English.
4. Studies published before 1992 were excluded due to the previous review (Stark, 1992) covering this time period.
5. Studies that were not published in peer-reviewed journals.
6. Reviews were excluded due to their aggregated level of reporting results, as they potentially could exclude information relevant to the current review.
7. Studies using treatment retention as primary outcome measure were excluded, as retention is usually operationalized as continuous variables such as length of stay or days in treatment. With these measures, the reason for treatment discontinuation often includes administrative discharge, expulsion, referral, and successful

treatment completion in addition to drop-out. With such operationalization, the opposite of retention is not interpretable as drop-out.

8. Animal model studies.
9. Studies reporting on interventions aimed at reducing drop-out, rather than factors increasing the risk of drop-out.
10. Studies that did not provide an active psychosocial treatment.
11. Alcohol only studies were excluded. With the increasing recognition of the interrelationships of addictions (Shaffer et al., 2004) and the considerable merger between drug and alcohol treatments (Roizen, 1993), we chose to focus on studies exploring these settings, thus excluding alcohol only treatments. Also alcohol use disorders have the highest prevalence rate globally, accounting for 53.9% of treatment demands among the WHO member states (WHO ATLAS, 2010). Including alcohol only treatments would greatly increase the proportion of the results based on alcohol use disorders, thus reducing the applicability of the review to a drug and alcohol treatment setting.
12. Studies enforcing formal coercion or mandatory treatment were excluded. Drop-out is generally defined as a patient initiated action. Coercion takes away the possibility of carrying out such an initiative.
13. Studies in which the majority of participants suffered from a serious somatic condition (e.g., HIV, traumatic head injury, pregnancy) or severe psychiatric diagnosis (e.g., schizophrenia, bipolar type 1) were also excluded. In studies where the majority have such conditions, drop-out is likely to be directly influenced by the treatments focus on the primary condition. Attributing drop-out or completion in such settings to the treatment of addiction may therefore be invalid.

2.3. Description of the studies

A total of 3771 studies were identified by the seven databases queried, out of which 2082 studies were identified as duplicates and removed. Of the remaining studies, 1136 were considered to be clearly irrelevant based on their titles. The abstracts of 551 studies were

manually screened, and 343 studies were excluded based on title, abstract or keywords. Exclusions were applied on a “first come, first serve” basis: When it became evident that one exclusion criterion applied to a study, it was excluded and categorized by that criterion. It follows that a number of studies are likely to have fulfilled several exclusion criteria. Flow chart illustrating the exclusion process can be found in Fig. 1. The remaining 208 studies were read in full. Based on the eligibility criteria, a total of 122 studies involving a total of 199,331 participants were included in the analysis. Key characteristics of the 122 included studies can be found in Table 1. Finally, we tested the quality of our search results by replicating the searches using Google Scholar. The results from Google Scholar either matched our previous searches or proved to be irrelevant based on our eligibility criteria.

2.4. Extraction of data

We developed a data extraction form based on the 38 studies from our preliminary search. The extraction form was developed using three strategies: (a) a top-down strategy based on the focus and findings of previous reviews; (b) a bottom-up strategy based on factor frequency in the preliminary search; and (c) consulting clinical experts on variables relevant for clinical practice. Originally, the data extraction form included 14 factors assigned to categories corresponding with our research questions: 1) *patient factors* (age, sex, level of education, marital status, primary substance of abuse, co-occurring disorder, and cognitive functioning), 2) *treatment factors* (method, duration, setting, and patient/staff-ratio), and 3) *treatment process factors* (motivation, treatment satisfaction, and therapeutic alliance). Due to the limited main effects between risk factors and drop-out in the previous review (Stark, 1992), we decided to document all significant moderation effects on drop out where at least one of the 14 risk factors was included in the interaction term. We also included study factors (drop-out definition, drop-out prevalence, sample size, research design, country, name of publication journal, and publication date).

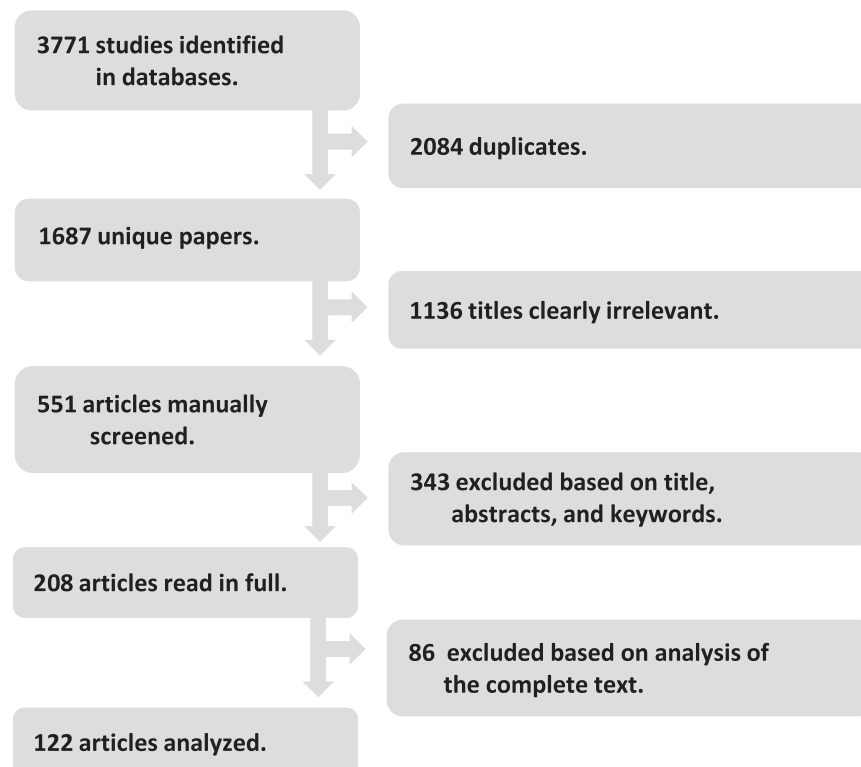


Fig. 1. Flowchart of identified articles and exclusions.

Table 1
Key characteristics of included studies ordered by number of participants.

nmb	Author	n	Dropout rate (%)	Country
1	(Brecht, Greenwell, & Anglin, 2005)	113575	58.0	US
2	(Beynon, McMinn, & Marr, 2008)	16626	10.1	UK
3	(Scott-Lennox, Rose, Bohlig, & Lennox, 2000)	9142	63.8	US
4	(Curran, Stecker, Han, & Booth, 2009)	8064	26.6	US
5	(Salamina et al., 2010)	5457	23.0	Italy
6	(Beynon, Bellis, & McVeigh, 2006)	4291	7.2–9.6	UK
7	(McKellar, Kelly, Harris, & Moos, 2006)	3649	12.0	US
8	(J. F. Kelly & Moos, 2003)	2778	40.0	US
9	(Stevens, Radcliffe, Sanders, & Hunt, 2008)	2624	24.5	UK
10	(Callaghan & Cunningham, 2002)	2595	15.9(m) 23.8 (f)	Canada
11	(Maglione, Chao, & Anglin, 2009)	2570	68.9	US
12	(Li, Sun, Purl, Marsh, & Anis, 2007)	2566	54.2	Canada
13	(Condelli, Koch, & Fletcher, 2000)	1573	0.4	US
14	(Gilchrist, Langohr, Fonseca, Muga, & Torrens, 2012)	1228	21.5	Spain
15	(Blondell, Amadasu, Servoss, & Smith, 2006)	1080	21.8	US
16	(Specka, Buchholz, Kuhlmann, Rist, & Scherbaum, 2011)	1017	43.0	Germany
17	(Callaghan, 2003)	877	29.0	Canada
18	(Chawdhary et al., 2007)	833	58.4	US
19	(Vendetti et al., 2002)	813	45.0	US
20	(Deane, Wootton, Hsu, & Kelly, 2012)	618	57.0	Australia
21	(Wintersteen, Mensinger, & Diamond, 2005)	600	21–45	US
22	(Pedersen, 2007)	565	n.a.	Denmark
23	(Marrero et al., 2005)	557	27.0	Puerto Rico
24	(Veach, Remley, Kippers, & Sorg, 2009)	509	27.7	US
25	(Fishman, Reynolds, & Riedel, 1999)	488	34.2/68.2	US
26	(Siqueland et al., 2002)	487	69.0	US
27	(Passos & Camacho, 2000)	468	57.0	Brazil
28	(López-Goñi, Fernández- Montalvo, Illescas, Landa, & Lorea, 2008)	430	59.8	Spain
29	(Ross, Cutler, & Sklar, 1997)	414	41.7	Canada
30	(Weinstock, Alessi, & Petry, 2007)	393	n.a.	US
31	(Lin et al., 2013)	368	67.0	Taiwan
32	(Ravndal, Vaglum, & Lauritzen, 2005)	307	60.0	Norway
33	(Rawson, Gonzales, Obert, McCann, & Brethen, 2005)	305	n.a.	US
34	(McMahon, Kelley, & Kouzekanani, 1993)	304	21.4	US
35	(Pettinati, Meyers, Jensen, Kaplan, & Evans, 1993)	303	n.a.	US
36	(Armenian, Chutuape, & Stitzer, 1999)	302	23.5	US
37	(Pouloupoulos, 1999)	299	74.0	Greece
38	(De Weert-van Oene, Burger, Grobbee, & Schrijvers, 2007)	292	31.0	The Netherlands
39	(De los Cobos, Trujols, Ribalta, & Casas, 1997)	275	17.8	Spain
40	(ClaUS & Kindleberger, 2002)	260	40.0	US
41	(Barber et al., 1999)	252	52.7	US
42	(Courmoyer, Brochu, Landry, & Bergeron, 2007)	248	45.0	Canada
43	(Alterman et al., 1997)	239	51.0	US
44	(Sosin & Durkin, 2007)	231	69.2	US
45	(Dakof, Tejada, & Liddle, 2001)	224	47.0	US
46	(Roffman, Klepsch, Wertz, Simpson, & Stephens, 1993)	212	31.1	US
47	(Nellori & Ernst, 2004)	207	20.0	US
48	(Dobkin, Civita, Paraheerakis, & Gill, 2002)	206	53.0	Canada
49	(Agosti, Nunes, & Oepeck-Welickson, 1996)	198	69.0	US
50	(Darke, Campbell, & Poppo, 2012)	191	17.0	Australia
51	(Meier, Donmall, McElduff, Barrowclough, & Heller, 2006)	187	47.0	UK
52	(Fowler, Groat, & Ulanday, 2013)	187	29.0	US
53	(Kenne, Boros, & Fischbein, 2010b)	184	n.a.	US
54	(Lejuez et al., 2008)	182	25.3	US
55	(Sayre et al., 2002)	165	65.0	US

Table 1 (continued)

nmb	Author	n	Dropout rate (%)	Country
56	(Amodeo, Chassler, Oettinger, Labiosa, & Lundgren, 2008)	164	79.9	US
57	(Rohsenow, Martin, Eaton, & Monti, 2007)	163	62.0	US
58	(Warden et al., 2012)	152	28/81	US
59	(Miller, Summers, & Gold, 1993)	150	8.0	US
60	(Smith, North, & Fox, 1996)	149	85.0	US
61	(Ravndal & Vaglum, 1994)	144	70.0	Norway
62	(Patkar, Murray, et al., 2004)	141	29.0	US
63	(Patkar, Thornton, et al., 2004)	140	38.6	US
64	(White, Winn, & Young, 1998)	138	26.1	US
65	(Levin et al., 2004)	135	78.5	US
66	(Blood & Cornwall, 1994)	132	42.0	US
67	(Callaghan et al., 2005)	130	55.4	Canada
68	(Raylu & Kaur, 2012)	130	n.a.	Australia
69	(Kampman et al., 2001)	128	68.0	US
70	(Marissen, Franken, Blanken, van den Brink, & Hendriks, 2007)	127	50.8	The Netherlands
71	(Curran, Kirchner, Worley, Rookey, & Booth, 2002)	126	20.0	US
72	(Samuel, LaPaglia, Maccarelli, Moore, & Ball, 2011)	126	17.0	US
73	(Öhlin, Hesse, Fridell, & Tätting, 2011)	123	50.0	Sweden
74	(López-Goñi, Fernández-Montalvo, & Arteaga, 2012)	122	31.3	Spain
75	(Doumas, Blasey, & Thacker, 2005)	120	33.0	US
76	(S. Kelly, Epstein, & McCrady, 2004)	120	71.0	US
77	(Saarnio & Knuuttila, 2003)	114	29.0	Finland
78	(Craig & Olson, 2004)	108	n.a.	US
79	(Hawkins, Baer, & Kivlahan, 2008)	107	41.0	US
80	(Petty & Bickel, 2000)	104	17.3	US
81	(Pagnin, de Queiroz, & Saggese, 2005)	104	90.4	Brazil
82	(Hoffman et al., 1994)	103	37.0	US
83	(Daughters, Richards, Gorka, & Sinha, 2009)	102	21.0	US
84	(Fernandez-Montalvo & López-Goñi, 2010)	102	30.4	Spain
85	(Williamson & Hood, 2012)	102	n.a.	US
86	(Smyth, Fagan, & Kerman, 2012)	100	32.0	Ireland
87	(Lovaglia & Matano, 1994)	98/66	17.0/24.0	US
88	(King & Canada, 2004)	97	36.0	US
89	(Kay-Lambkin, Baker, Lewin, & Carr, 2011)	97	49.0	Australia
90	(Alterman, McKay, Mulvaney, & McLellan, 1996)	95	41.0	US
91	(Teichner, Horner, Roitzsch, Herron, & Thevos, 2002)	94	38.8	US
92	(Coviello et al., 2001)	94	60.0	US
93	(De Weert-Van Oene, Schippers, De Jong, & Schrijvers, 2001)	93	26.0	The Netherlands
94	(Palmer, Palmer, & Williamson, 1995)	92	25.0	US
95	(Brener, Von Hippel, Von Hippel, Resnick, & Treloar, 2010)	92	62.0	Australia
96	(Hien, Nunes, Levin, & Fraser, 2000)	91	51.0	US
97	(Noel, 2006)	90	n.a.	US
98	(Mulvaney, Alterman, Boardman, & Kampman, 1999)	87	43.0	US
99	(Simons, 2008)	80	50.0	US
100	(Shoni Davis, 2009)	80	51.3	US
101	(McHugh et al., 2013)	78	23.0	US
102	(Streeter et al., 2007)	74	32.4	US
103	(Santónja-Gómez et al., 2010)	70	50.0	Spain
104	(HelmUS, Downey, Arfken, Henderson, & SchUster, 2001)	68	63.2	US
105	(Shelef, Diamond, Diamond, & Liddle, 2005)	65	19.0	US
106	(O'Neill, Lidz, & Heilbrun, 2003)	64	n.a.	US
107	(Giyaur, Sharf, & Hilsenroth, 2005)	63	57.0	US
108	(Berg, 2009)	61	29.5	Norway
109	(Andersen & Berg, 2009)	60	71.7	Norway
110	(Cordaro, Tubman, Wagner, & Morris, 2012)	58	0.0	US
111	(Murphy & Bentall, 1999)	57	54.4	UK
112	(Aharonovich et al., 2006)	56	71.4	US
113	(Dziedzic, London, & Tilbury, 1998)	50	56.0	UK

Table 1 (continued)

nmb	Author	n	Dropout rate (%)	Country
114	(Srisurapanont, Sombatmai, & Boripuntakul, 2007)	48	39.6	Thailand
115	(Wan, Baldrige, Colby, & Stanford, 2010)	44	41.0	US
116	(Brady, Dansky, Back, Foa, & Carroll, 2001)	39	61.5	US
117	(Slesnick, 2001)	36	n.a.	US
118	(Anderson, Baldrige, & Stanford, 2011)	35	37.0	US
119	(Robbins et al., 2006)	30	43.3	US
120	(Wilson, Levin, Donovan, & Nunes, 2006)	28	n.a.	US
121	(Venneman et al., 2006)	25	20.0	US
122	(Aharonovich, Brooks, Nunes, & Hasin, 2008)	20	65.0	US

n.a. = Not applicable.

The first author, a licensed psychologist, and a student at the end of a professional degree program in psychology reviewed the studies independently using the extraction form. Before commencing data extraction from the complete set of studies, we assessed inter-rater reliability (Cohen's Kappa) using the coding of the first six studies. Once the inter-rater reliability was established ($\kappa = 0.80$) the reviewers began the extraction. The reliability was rechecked when each reviewer had independently extracted twenty studies, with continued reliable results ($\kappa = 0.81$). Any disagreement between the two reviewers was solved through a discussion. If disagreement persisted, the service of a third independent reviewer was enlisted.

2.5. Analysis

Due to heterogeneity in the study design, the statistical measures used, the setting, the patient group, the treatment method, and the drop-out definition, it was not possible to pool the results and perform a meaningful meta-analysis directly. A "box-score" approach was chosen to examine all of the included studies. The use of a box-score provides an estimate of the replicability of findings under varied observation conditions with varied research subjects. Consistent replicability across such variations is an indicator of robustness (Orlinsky, Ronnestad, & Willutzki, 2004). We examined all of the extracted factors on three levels; (i) identifying how frequently a factor was studied, (ii) whether the factor met the criterion for statistical significance, (iii) and the observed direction of significant findings.

The included studies displayed enormous variation in the number of participants, ranging from 20 to 113,575. The size difference contributed to making the studies less comparable due to the rule of large numbers: Larger studies may more easily achieve statistical significance for smaller effects. Conversely, consistent statistical significance in the case of the smaller studies requires greater effect sizes. Accordingly, we decided to perform analyses first on all of the included studies ($n = 122$) and then separately on the larger studies, using a cut-off of 500 participants ($n = 24$), and to use the results as a test of reliability. The cut-off at 500 participants was essentially arbitrary. We were unable to identify any meaningful number of participants for a study to be considered "large", and we found no obvious elbows in the distribution of the number of participants. To determine whether our findings were heavily dependent on the chosen cut-off, we performed two separate sensitivity analyses using cut-offs at 800 and 300 participants. Our findings proved to be robust in both cases.

3. Results

In the following section findings are presented on the prevalence, statistical significance, and directionality of each potential risk factor (see Table 2 and Fig. 2). Findings that were not replicated in the analysis of the large studies are reported separately.

3.1. Patient factors

3.1.1. Age

The most frequently studied factor in our material was age. In total, 72 (59%) of the included studies investigated the relationship between age and drop-out. Out of these, 46 studies found no association between the two factors. In the 26 studies that did report an association between age and drop-out, 23 studies linked younger age to an increased risk of dropping out. This majority of non-significance was not replicated in our analysis of the larger studies. In total, 18 of the 24 large studies examined the association between age and drop-out, and twelve of them had statistically significant results. Of these 12 studies, eleven reported younger age to significantly increase drop-out risk.

3.1.2. Sex

In total, 64 (52%) of the included studies investigated the association between sex and drop-out, and 10 studies reported significant associations. However, in the 10 studies that found an association, five reported that being male predicted drop-out, whereas the remaining five studies reported a greater drop-out risk for female patients.

3.1.3. Education

A total of 42 (34%) studies explored the relationship between education level and drop-out. Nine studies reported statistically significant associations between drop-out and education, with lower education being a risk factor.

3.1.4. Substance use

A total of 38 (31%) studies divided patients into subgroups based on their primary substance of abuse and investigated their relationship with drop-out. A total of 26 studies examined the relationship between having alcohol as the primary substance of abuse in a drug and alcohol treatment setting and risk of dropping out. Five studies confirmed such a relationship, but not in a consistent manner. Nineteen studies investigated the relationship between using cocaine and dropping out of addiction treatment; of these nineteen studies, six confirmed this association. There were a greater proportion of significant findings among the larger studies: Three studies concluded that cocaine users are more apt to drop-out, whereas three studies showed no significant relationship between cocaine use and drop-out. The relationship between opiate use and drop-out was studied in 14 studies and was found to be statistically significant in five studies. There were a greater proportion of significant findings among the larger studies. Four studies found an increased risk of drop-out associated with using opiates, whereas a one study found that opiate use was unrelated. Thirteen studies explored the relationship between cannabis use and drop-out; of these studies, none reached statistical significance. Eighteen studies investigated polysubstance use as a drop-out risk factor; of these studies, five confirmed the correlation. Sixteen studies used unspecific labels such as "preferred drugs other than alcohol", "type of drug was largely unrelated" and "use of drugs" as predictors of drop-out. These unspecified labels showed a significant association with drop-out in five studies.

3.1.5. Co-occurring disorder

A total of 38 (31%) studies investigated the association between having a co-occurring disorder and dropping out of addiction treatment.

Mood disorders were studied in 23 studies, and the association was statistically significant in five studies. The association between anxiety and drop-out was studied in 14 studies and was found to be statistically significant in four. Seven of these studies investigated the association between PTSD and drop-out, all of which disconfirmed the association. In total, 13 studies investigated personality disorders as a drop-out risk factor, and nine studies confirmed the association. Among the thirteen studies considering personality disorders, twelve studies investigated anti-social personality disorder (ASPD), and eight of these confirmed the association. Eight studies considered borderline personality disorder (BPD), and the association was confirmed in two studies. Six studies investigated histrionic personality disorder (HPD) as a drop-out risk factor, and four studies confirmed the association. Nineteen studies used unspecific labels such as “comorbid psychological disorders” and “no-substance disorder”. Eight studies demonstrated an association between these unspecific labels and drop-out.

3.1.6. Marital status

A total of 36 (29%) studies explored the relationship between marital status and drop-out, but only four studies reported an association. The few significant findings suggest that patients who are not currently in a relationship have an increased risk of dropping out.

3.1.7. Cognitive functioning

A total of eleven (9%) studies explored the relationship between cognitive function and drop-out. All ten studies reported statistically significant associations between drop-out and cognitive functioning, with lower cognitive functioning resulting in a higher degree of drop-out.

3.2. Treatment factors

3.2.1. Treatment method

A total of eight (6%) studies investigated treatment method as a drop-out risk factor. The studies explored cognitive-behavioral therapy (CBT) versus multidimensional family therapy, CBT-based relapse prevention versus social support, CBT versus traditional counseling, therapist delivered interventions versus computer-delivered interventions, psychiatric inpatient treatment versus non-psychiatric inpatient treatment, community reinforcement approach versus standard treatment group, cue exposure therapy versus non-specific psychotherapy, and standard group therapy versus more frequent and intensive group therapy. Standard group therapy and cue exposure therapy in the latter two studies were related to an increased risk of drop-out.

3.2.2. Treatment setting

A total of four (3%) studies investigated the relationship between treatment setting and drop-out. Three studies reported a significant relationship, with nonresidential or outpatient treatments relating to an increase in drop-out.

3.2.3. Treatment duration

A total of one (1%) study investigated the relationship between treatment duration and drop-out. The study found a significant relationship between longer treatment duration and higher drop-out.

3.2.4. Patient/staff-ratio

None (0%) of the selected studies investigated the relationship between the patient/staff-ratio and drop-out.

3.3. Treatment process factors

3.3.1. Motivation

A total of nine (7%) studies investigated the predictive effect of motivation, and five studies found a statistically significant relationship. Two studies found lower motivation relating to higher drop-out, two

studies observed higher motivation relating to higher drop-out, and one study reported higher extrinsic motivation (probation) increasing likelihood of drop-out, whereas higher intrinsic motivation was unrelated. There were a smaller proportion of significant findings among the larger studies. In total, three of the 20 large studies examined the association between motivation and drop-out. One study reported a positive association between motivation and dropping out, whereas two studies found no significant relationship between the two factors.

3.3.2. Alliance

A total of six (5%) studies investigated alliance, and all reported statistically significant associations, with lower alliance consistently relating to higher drop-out.

3.3.3. Treatment satisfaction

Three (2%) studies investigated the association between patient satisfaction with treatment and drop-out. Two studies reported low treatment satisfaction significantly increased the risk of drop-out, whereas a third study found that baseline satisfaction or change in satisfaction was not related to drop-out.

3.4. Interactions

Fourteen (11%) studies investigated more complex relations where the moderating effect of at least one of the risk factors on drop-out was included. Three studies reported an interaction between age and drop-out, and one of these interactions also included level of motivation. The moderating effect of sex on drop-out was documented in four studies, of which two studies also included unspecific co-occurring disorders in the interaction term, and a third interaction included treatment length. One study reported an education moderated risk of drop-out. Two studies found treatment method having a moderating effect on drop-out, and one of these also included an unspecific co-occurring disorder. One study observed a significant moderation effect on drop-out with co-occurring disorder and substance use in the interaction term. Alliance had a significant moderating effect on drop-out in three studies, and one interaction also included sex. Treatment satisfaction interacted with age and cognitive function in the prediction of drop-out in one study.

4. Discussion

Overall, most studies had conceptualized risk factors as relatively enduring characteristics of patients. Of the included studies, 91% examined patient factors such as age, sex, education, marital status, substance use, co-occurring disorder, and cognitive functioning. In comparison, only 4% of the studies considered risk factors associated with the treatment program (e.g., treatment duration, setting, method, and patient/staff ratio). The extensive focus on patient factors corresponds well with a traditional medical understanding of addiction, where drop-out is viewed as the result of an underlying pathology or abnormality present in the patient. Adherence to the medical model might explain the lack of research on the dynamics between the patient and the context of the treatment situation. Only 5% of the studies investigated predictors beyond those available at baseline (e.g., alliance, motivation, and treatment satisfaction). The current review has identified important gaps in the research, as well as many contradictory and non-significant findings. Of all factors studied, younger age, cognitive deficits, ASPD/HPD, and treatment alliance displayed fairly consistent associations with drop-out across varying study designs, samples, and methods. These risk factors will be discussed in greater detail.

4.1. Patient factors

Based on their meta-analysis, [Wierzbicki and Pekarik \(1993\)](#) recommended psychotherapy research to abandon the search for simple demographic predictors of drop-out. Our results show that the

Table 2
Number of studies on specific risk factors and number of significant findings.

Variable	n analyzed	n sign.	Risk group	Studies, number in Table 1, significant in bold
Age	72	26	Older: 3 Younger: 23	1, 3, 4, 6, 7, 9, 12, 14, 17, 18, 19, 23, 28, 32, 36, 37, 38, 44, 46, 49, 51, 53, 68, 73, 91, 101 5, 10, 11, 15, 20, 24, 25, 29, 31, 33, 34, 39, 43, 47, 50, 52, 54, 55, 56, 58, 62, 66, 67, 71, 76, 79, 80, 83, 84, 87, 88, 93, 94, 95, 99, 100, 103, 107, 108, 112, 114, 115, 116, 117, 118, 121
Sex	64	10	Female: 5 Male: 5	4, 11, 12, 28, 38, 55, 61, 80, 88, 109 5, 6, 9, 10, 14, 15, 16, 17, 19, 20, 23, 24, 25, 27, 29, 31, 32, 33, 36, 37, 39, 40, 43, 47, 48, 49, 50, 51, 52, 53, 54, 56, 58, 62, 67, 74, 83, 84, 86, 87, 93, 94, 95, 96, 101, 103, 107, 108, 112, 114, 115, 116, 117, 121
Education	42	9	Low: 9 High: 0	1, 19, 38, 51, 55, 62, 103, 112, 116 5, 7, 11, 14, 23, 27, 28, 31, 34, 36, 40, 46, 47, 49, 50, 53, 54, 56, 58, 66, 71, 74, 76, 80, 83, 88, 93, 95, 100, 101, 114, 115, 118
Marital status	36	4	Single: 3 Separated: 1	5, 17, 19, 55 3, 4, 14, 23, 24, 25, 27, 28, 31, 34, 36, 38, 39, 40, 49, 58, 62, 71, 74, 76, 79, 87, 88, 93, 99, 100, 103, 107, 112, 115, 116, 117
Cognition	11	11		7, 54, 62, 91, 102, 112, 115, 118, 120, 121, 122
Motivation	9	5	Lower: 2 Higher: 3	8, 40, 67, 93, 113 7, 23, 31, 51
Treatment method	8	2	CET: 1 Group therapy: 1	70, 82 45, 46, 89, 103, 109, 113
Alliance Setting	6 4	6 3	Outpatient: 3	15, 41, 42, 51, 107, 110 35, 40, 60
Treatment satisfaction	3	2		7, 23 92 79
Treatment duration	1	1		4
Co-occurrent disorders				
Psychosis	2	1		4 50
ADHD	1	1		65
Personality disorders				
Anti-social	12	8		32^b, 34, 60, 72, 73, 75, 84, 106 65, 74, 83, 90
Borderline	8	2		32^b, 75 34, 50, 72, 74, 83, 84
Histrionic	6	4		32^b, 72, 74, 84 34, 74
Other	7	2		32^b, 74 34, 65, 72, 74, 84
Unspecifex mental	18	8		1, 5, 31, 40, 52, 56, 99, 101 7, 16, 56, 58, 74, 84, 90, 103, 108, 117
Mood disorders	18	5		18, 54, 65, 71, 75 4, 20, 23, 31, 50, 55, 60, 61, 83, 90, 94, 103, 116
Anxiety disorders	14	4		54, 65, 75, 101 4, 20, 31, 50, 60, 71, 83, 96, 116, 118
PTSD	7	0		4, 50, 60, 71, 83, 96, 118
Specific substance use				
Cocaine	19	6		5, 14, 24, 25, 81, 101 10, 12, 16, 27, 47, 54, 60, 63, 74, 83, 88, 93, 94

Table 2 (continued)

Variable	n analyzed	n sign.	Risk group	Studies, number in Table 1, significant in bold
Opiates	14	5		10, 12, 14, 15, 47 24, 25, 27, 50, 54, 74, 83, 88, 93
Alcohol	26	5	^a	3, 7, 12, 74, 80 15, 16, 17, 24, 25, 27 ^d , 32 ^c , 47, 50, 54, 60, 63, 71, 83, 88, 90, 93, 94, 99, 103, 117
Cannabis	13	0		16, 24, 27, 32 ^c , 50, 54, 60, 74, 81, 83, 88, 90, 93
Unspecified/ other	18	5		3, 7, 14, 17, 20 16, 24, 27, 50, 52, 54, 71, 88, 94, 99, 103, 116, 117
Poly-substance	18	5		1, 27^d, 58, 73, 84 3, 10, 12, 24, 25, 27 ^d , 31, 38, 55, 63, 81, 88, 93

^a Some studies report that low consumption of alcohol is a risk factors. Studies 7 and 11 reported alcohol predicting pre-treatment dropout, and less alcohol predicting treatment dropout.

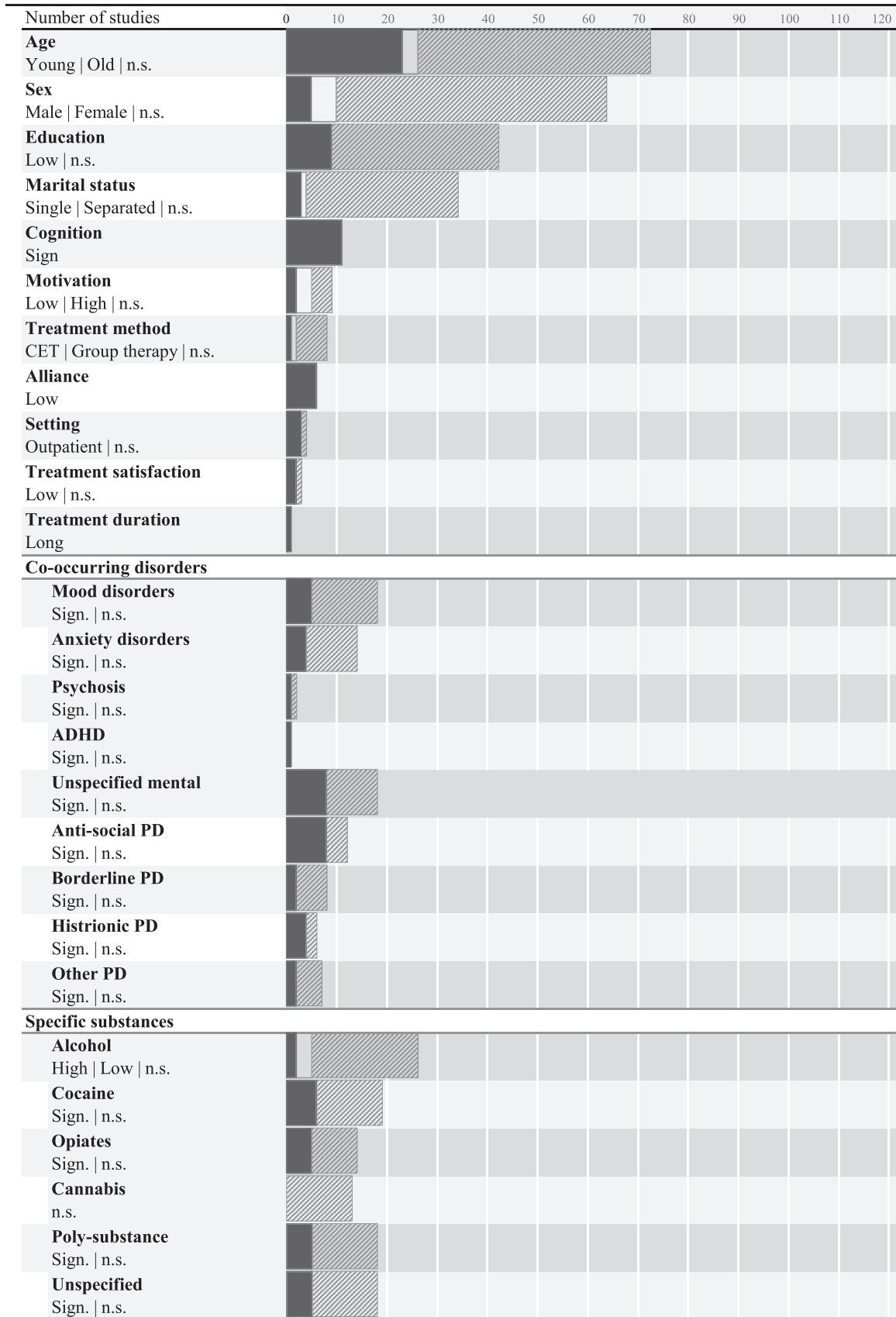
^b Only veterans

^c Only debutants

^d Poly-substance predicts dropout only when alcohols is involved

recommendation should be generalized to addiction research. The vast majority of studies in our study found no association between age and drop-out, but those that did tended to find younger age linked to higher rates of drop-out from addiction treatment. The majority of the large studies reported positive findings between younger age and higher drop-out. This pattern suggests that younger age is a small risk factor, as such factors will be consistently identified in studies with sufficient sample size. With the caveat that the threshold value for old vs. young participants varied between studies, the finding that younger age is a risk factor seems plausible in light of other research on age and development. Adolescents have long been described as being particularly prone to risk taking and impulsivity, which is exemplified by their heightened level of substance use (Williams & Chang, 2000) and higher prevalence of car accidents and unsafe sex (Arnett, 1992). Many researchers have argued that the processes of the maturing prefrontal cortex predispose adolescents to risky behavior and impulsivity (Romer, 2010). This brain area often begins to develop at approximately age 11 and continues developing into our late twenties. As a result of this long period of prefrontal development, adolescents exhibit impaired behavioral and cognitive control, similar to patients with prefrontal cortex damage (Thompson-Schill, Ramscar, & Chryssikou, 2009).

Many of the cognitive functions that differentiate completers from drop-outs are located in the prefrontal cortex (Fuster, 1989). Indeed, when separately examining cognitive factors and their association to drop-out, we discovered that cognitive deficits consistently relates to an increased risk of dropping out. The consistency in the smaller studies indicates a substantial predictive effect, and the replication in the larger study supports the finding as not coincidental. Cognitive deficits associated with attention, memory, abstract reasoning and verbal skills are common among patients in addiction treatment (Aharonovich et al., 2006, 2008; Teichner et al., 2002). Addiction treatments rely heavily on communication and the ability to learn new strategies for coping with stress, psychological symptoms, and relational difficulties. Treatment thus involves numerous cognitive functions, and poorer outcomes may be expected for patients with deficits in one or more relevant cognitive domains. Thus, it is not surprising that Aharonovich et al. (2008) found that completers scored approximately 0.5 SD above the population mean on abstract reasoning, whereas the drop-outs scored approximately 0.5 SD below the population mean. It is possible that the poor prognosis associated with addiction is in part due to the fact that previous treatments have not addressed underlying cognitive deficits. A reconceptualization of the patient group as *cognitively impaired patients with co-occurring substance abuse* rather than *substance users* might better reflect their treatment needs.



Sign.: risk factor reported statistically significant.
 n.s.: risk factor not found statistically significant.
 PD: Personality disorder

Fig. 2. Number of studies investigating and identifying drop-out risk factors.

Cognitive deficits are also common among patients diagnosed with personality disorders, and some researchers have suggested that certain personality disorders and their characteristics are the psychological manifestation of cognitive deficits (Coolidge, Thede, & Jang, 2004). This may in part explain why substance abusing patients diagnosed with ASPD or HPD appear to be at higher risk of drop-out. In an extensive meta-analysis, Morgan and Lilienfeld (2000) found that ASPD groups performed 0.6 SD worse on cognitive tests than comparison groups. ASPD patients are likely to exhibit several cognitive deficits that place them at risk of drop-out, including impulsivity and poor affect regulation. A significant number of people with ASPD are treated by drug and alcohol services. Verheul, Van den Brink, and Hartgers (1995) reported ASPD prevalence ranging from 18 to 30% in drug and alcohol services, and recently treatments specifically targeting ASPD have begun to develop (Bateman & Fonagy, 2008). The HPD criteria reflect many of the characteristics that place ASPD patients at risk of drop-out, that is propensities toward impulsivity, excitement seeking, low frustration tolerance for delays in gratification, and problems in attaining long-term goals or completing long-term projects (Coolidge et al., 2004). Some studies indicate that HPD and ASPD tend to covary among patients and some researchers have suggested that HPD and ASPD are sex-typed manifestations of the same underlying impairments (Ford & Widiger, 1989; Salekin, Rogers, & Sewell, 1997). It is worth noting that HPD may be removed from future revisions of the DSM manual. This group of patients, with their apparent increase risk of drop-out, is then likely to be found in other diagnostic groups.

Dysfunction in prefrontal cortex could account for a variety of interpersonal and behavioral problems implicated in an increased risk of drop-out associated with younger patients, patients diagnosed with ASPD or HPD, and patients suffering from cognitive deficits without presenting with ASPD or HPD. Interestingly, in addition to being a risk factor for drop-out, cognitive functioning has been found to differ between completers and drop-outs, with effect sizes in the moderate to large range (Aharonovich et al., 2006). This set of findings is compatible with two very different interpretations: First, that prefrontal dysfunction is a risk factor for drop-out, and that drop-out is a cause of less favorable outcomes. Alternatively, the findings are compatible with the view that prefrontal dysfunction is the direct cause both of drop-out and of less favorable outcomes. Unfortunately, the “more treatment is better”-idea, is often based on uncontrolled follow-up studies, in which patient motivation and biased samples might be primarily responsible for the positive outcome (Luty, 2003). Thus, one might speculate as to what extent completers would have a better outcome regardless of treatment length. While we are of the belief that the improved outcomes observed with completion should, at least to a large part, be attributed to treatment, and that drop-out constitutes a separate risk factor for impaired outcome, the available literature does not allow us to conclusively discount the possibility that prefrontal dysfunction may be the predominant determinant both of completion and of outcome. In order to be able to confidently attribute the improvement found in completers to effects of the treatment, rather than to the lack of prefrontal dysfunction, more sophisticated study designs may be required.

4.2. Treatment factors

Treatment-related factors have been reported among the best predictors of treatment outcome (Simpson, Joe, Rowan-Szal, & Greener, 1997) and may have the potential to influence treatment completion (Curran et al., 2009). However, in the extant literature, there were generally too few studies to allow firm conclusions to be drawn on the value of treatment factors. However, single studies show encouraging findings for the treatment factors that were investigated. The one study addressing treatment duration as a potential drop-out risk factor suggest an increased risk of drop-out associated with more treatment hours offered. This is consistent with previous review (Stark, 1992). It may be that longer duration of treatment is discouraging for ambivalent patients,

or for those struggling to maintain long term goals, or it might be that there are group differences between patients in the different treatment modalities. The studies included in this review cannot answer this question. Further research should be more specific regarding treatment factors and include statistical analysis that can differentiate between group characteristics and treatment factors as main predictors for outcome.

4.3. Treatment process factors

Focusing separately on patient factors and treatment factors may obscure drop-out risk factors depending on the interplay between the two. More recent research has therefore focused on the treatment process and risk factors associated with the dynamic process between the patient and the treatment environment (McKellar et al., 2006). Treatment alliance is recognized as a significant predictor of outcome in most forms of psychotherapy and has thus received considerable research attention (Barber et al., 1999; Horvath & Bedi, 2002). Horvath and Symonds (1991) report an average effect size in the moderate range between treatment alliance and outcome. In our study, alliance emerged as one of the most promising predictors, consistently relating low alliance to an increased risk of drop-out. The pattern was replicated in the larger study investigating alliance. Alliance is the result of a complex transaction between therapist and patient (Gelso & Carter, 1994), and distinguishing between the roles of patient and therapist variability is critical to understanding the correlation between alliance and outcome. Baldwin, Wampold, and Imel (2007) found that therapist variability in the alliance predicted outcome, whereas patient variability was unrelated. Previous research with substance abusing patients also indicates the impact of therapist characteristics or actions on outcomes such as drop-out (McLellan, Luborsky, Woody, & Goebel, 1988). Future research should focus on the interdependence between alliance, therapist variables and drop-out.

We were surprised by the small number of studies assessing the relationship between alliance and drop-out, and we wondered whether this dearth could be due in part to our eligibility criteria. The criterion of excluding retention research left out eleven studies, of which four dealt with treatment alliance. Nevertheless, if we included these studies, the total number of studies dealing with this factor would still be low. The small number of studies reflects a real lack of research on this factor in general and not just a selection bias in the study selection process. This notion is supported by Barber et al. (1999), who states that although alliance has been studied extensively in other patient populations, the correlation between alliance and drop-out in substance abuse treatment has rarely been examined.

4.4. Interactions

It is generally found in medical and psychological research that one size does not fit all (MacKinnon & Luecken, 2008), and the many conflicting and non-significant findings in our study adds to that notion. This was particularly evident among the demographic risk factors. However, the studies applying moderator analysis that included demographic risk factors generally found significant interactions. That is, demographic risk factors moderated the relationship between treatment process factors (i.e., motivation, alliance, treatment satisfaction) and drop-out; and between treatment factors (i.e., treatment length, treatment method) and drop-out. Yet, few of the included studies explored moderators. This is unfortunate, because the results indicate a potential for furthering our understanding of drop-out prediction. Among the studies that do examine moderators, several left out information on the statistical method used to examine the effect. This makes their findings difficult to replicate and leaves uncertainty as to whether the interaction terms used in the studies actually refer to statistical definitions. Further research is needed.

4.5. Methodological considerations

Despite the methodological recommendations from previous reviews (Baekeland & Lundwall, 1975; Craig, 1985; Stark, 1992), methodological limitations persist within many of the studies included in our review. Perhaps one of the most notable of these concerns relates to the great heterogeneity in drop-out definitions. Based on our literature review, we note that addiction research still lacks a unified definition of drop-out. Results of drop-out studies are therefore difficult to compare, limiting the potential clinical ramifications. Another related problem is the many, and sometimes poorly described, definitions of risk factors, together with a wide variety of methods used to assess the potential risk factors. An example of the latter two was particularly salient in the studies investigating co-occurring disorders. The studies used methods ranging from standardized methods (i.e., structured interviews, semi structured interviews and self-report questionnaires) to non-standardized methods (i.e., clinical interviews, chart evaluation and assessments not fully specified). In their study on the prevalence of personality disorders among drug addicts and alcoholics, Verheul et al. (1995) found that method effects in part could account for the findings. Furthermore, different studies applied different criteria for classification of mental disorders (e.g., DSM criteria, The Addiction Severity Index). We conclude by suggesting that there is an urgent need for a standardized terminology and measurement methods within the field of addiction research.

4.6. Limitations

We developed our search strategy based on a preliminary search using Medline and PsychINFO. The scope of these indexing services may have resulted in search terms that are common in psychological and medical research, possibly at the expense of terms more common in sociological research. Similarly, depending on the representativeness of the papers identified in our preliminary searches, we may have missed potentially relevant search terms. However, based on the substantial number of articles identified by our search terms and the replication in Google Scholar, we believe that potential selection biases have been adequately minimized. Since this review exclusively included studies published in peer-reviewed journals, it is vulnerable to the effects of publication bias (Ioannidis, 2005), potentially suggesting that there is stronger support for a risk factor than that which really exists. The coding of the studies is also a potential source of errors. Particularly, some information given was interpretable as fitting into more than one category. When faced with coding difficulties, the two reviewers consulted one another to improve the quality of the decision. When the reviewers failed to agree, a third, independent, reviewer was enlisted as arbiter. Another potential source of error could result from our decision to categorize articles by taking the descriptions used by the authors at face value, for example, when the authors stated that they considered the factor 'motivation', we categorized this factor as 'motivation', regardless of how motivation was operationalized. Unfortunately, many of the papers failed to detail how they defined or operationalized their predictors, and those that did displayed substantial variation. Thus, if we were to categorize based on similar operationalization, each category would contain only a few studies. The categories, based on the authors' descriptions, may be less homogenous than would be ideal. This also applies within categories. In the case of age as a risk factor, the threshold age for being old varied between studies, but we have coded as old/young based on the terminology used in the paper. Lastly, there are some important limitations of our 'box score' approach. This approach for summarizing the evidence simplifies the findings, and only tells the reader how often a factor is associated with an increased risk of drop-out, not the extent to which each factor increases the risk of drop-out. A reasonable alternative is meta-analytical estimation of effect sizes, an approach that has been used to investigate drop-out risk factors from general psychotherapy (Wierzbicki & Pekarik, 1993). However, in our decision of methodological approach we considered the lack of similarity in the definition

of drop-out as a major problem if using meta-regression. The data we would have available for a meta-regression model would be quite divergent, making it very hard to interpret the results, and might even lead to misleading results. We therefore judged the box score approach as reasonable and transparent for our data.

5. Conclusion and implications

5.1. Implications for practice

Although most patient factors are irrelevant as predictors of drop-out, therapists need to be aware of the increased vulnerability for drop-out associated with younger patients, cognitive dysfunction, and having a diagnosis of ASPD/HPD. For treatment providers to counteract drop-out, they must begin by identifying high-risk patients. This approach entails assessing cognitive functioning and screening for ASPD/HPD at baseline. Secondly, treatment should be designed accordingly to boost retention. Evidence supports both the predictive and modifying effects that treatment environment has on patients at risk of drop-out. McKellar et al. (2006) found that high risk patients (e.g., younger, cognitive deficits) were less likely to drop-out when the treatment environment was appraised as high in support and low in control. In practical terms, staff and therapists should not try to control high risk patients, but rather try to involve them in decisions about their treatment. Additional adjustments should be made for patients struggling with cognitive deficits. The treatment program could counter such deficits in part by offering shorter therapy sessions for those who struggle with maintaining focus, individual therapy rather than group for those who are easily distracted, or supplement therapy with illustrative drawings for those with lower abstract reasoning. The field of traumatic brain injury (TBI) could be consulted to guide and inspire ways of adjusting treatment.

The significant relationship between ASPD/HPD and cognitive dysfunction indicates that treatment adjustments made to accommodate patients with cognitive deficits may also be beneficial to patients diagnosed with ASPD/HPD. A significant number of people with ASPD/HPD are treated by drug and alcohol services, but in these settings, treatment focus is generally on the drug or alcohol misuse, not the personality problem. This outcome suggests that addiction treatment providers need to adapt their programs to meet the needs of patients with ASPD/HPD.

Low alliance emerged as a promising predictor of drop-out in our study. The finding stresses the importance of attending to therapeutic alliance in addiction treatment. Using measures of alliance as a clinical tool, therapists can be warned of poor alliance and accordingly take remediating actions. Baldwin et al. (2007) demonstrated the importance of therapist variability in the alliance with regard to outcome. Thus, a therapist struggling to establish a good alliance should attend to his or her contributions rather than focus on patient characteristics that impede the development of alliance. Training programs aimed at helping therapists improve alliance are being developed and produce moderate to large increases in alliance (Crits-Christoph et al., 2006).

5.2. Implications for research

Our hope is that the next systematic review can use meta-analysis. Accordingly, future studies must include more thorough descriptions of designs and procedures, researchers must agree on definitions of drop-out, and effect sizes must be reported in ways that allow for comparison. Prospective trials focusing on treatment factors and treatment process factors are called for. There is no need for further replication of studies on demographic factors including age, education, marital status, and sex. However, studies aimed at understanding demographic factors as moderators could provide more insights into the possible mechanisms of drop-out. Phrased differently, research on demographics needs to shift the scope from *what* predicts drop-out, into *when, for whom, and under what conditions* drop-out is likely.

Acknowledgments

We thank Erik Vasaasen for his time spent refining the search strategy and discussing analyses presented in this article.

References

- Agosti, V., Nunes, E., & Ocepeck-Welikson, K. (1996). Patient factors related to early attrition from an outpatient cocaine research clinic. *The American Journal of Drug and Alcohol Abuse*, 22(1), 29–39. <http://dx.doi.org/10.3109/0095299609001643>.
- Aharonovich, E., Brooks, A. C., Nunes, E. V., & Hasin, D. S. (2008). Cognitive deficits in marijuana users: Effects on motivational enhancement therapy plus cognitive behavioral therapy treatment outcome. *Drug and Alcohol Dependence*, 95(3), 279–283. <http://dx.doi.org/10.1016/j.drugalcdep.2008.01.009>.
- Aharonovich, E., Hasin, D. S., Brooks, A. C., Liu, X., Bisaga, A., & Nunes, E. V. (2006). Cognitive deficits predict low treatment retention in cocaine dependent patients. *Drug and Alcohol Dependence*, 81(3), 313–322. <http://dx.doi.org/10.1016/j.drugalcdep.2005.08.003>.
- Alterman, A. I., Kampman, K., Boardman, C. R., Cacciola, J. S., Rutherford, M. J., McKay, J. R., et al. (1997). A cocaine-positive baseline urine predicts outpatient treatment attrition and failure to attain initial abstinence. *Drug and Alcohol Dependence*, 46(1–2), 79–85. [http://dx.doi.org/10.1016/S0376-8716\(97\)00049-5](http://dx.doi.org/10.1016/S0376-8716(97)00049-5).
- Alterman, Arthur I., McKay, J. R., Mulvaney, F. D., & McLellan, A. T. (1996). Prediction of attrition from day hospital treatment in lower socioeconomic cocaine-dependent men. *Drug and Alcohol Dependence*, 40(3), 227–233. [http://dx.doi.org/10.1016/0376-8716\(95\)01212-5](http://dx.doi.org/10.1016/0376-8716(95)01212-5).
- American Psychiatric Association (2007). *Treatment of patients with substance use disorders*. American Psychiatric Association (Retrieved from http://www.bmchealthplans.com/app_assets/bmc-healthnet-plan-clinical-guidelines-for-substance-abuse_20130403t161926_en_web_e3dc3396d56440c80301722934dbb2.pdf).
- Amodeo, M., Chassler, D., Oettinger, C., Labiosa, W., & Lundgren, L. M. (2008). Client retention in residential drug treatment for Latinos. *Evaluation and Program Planning*, 31(1), 102–112. <http://dx.doi.org/10.1016/j.evalprogplan.2007.05.008>.
- Andersen, S., & Berg, J. E. (2009). *The use of a sense of coherence test to predict drop-out and mortality after residential treatment of substance abuse*. research-article. (Retrieved 27 November 2010, from <http://informahealthcare.com/doi/abs/10.3109/16066350109141752>).
- Anderson, N. E., Baldrige, R. M., & Stanford, M. S. (2011). P3a amplitude predicts successful treatment program completion in substance-dependent individuals. *Substance Use & Misuse*, 46(5), 669–677. <http://dx.doi.org/10.3109/10826084.2010.528123>.
- Armenian, S. H., Chutuape, M. A., & Stitzer, M. L. (1999). Predictors of discharges against medical advice from a short-term hospital detoxification unit. *Drug and Alcohol Dependence*, 56(1), 1–8. [http://dx.doi.org/10.1016/S0376-8716\(99\)00027-7](http://dx.doi.org/10.1016/S0376-8716(99)00027-7).
- Arnett, J. (1992). Reckless behavior in adolescence: A developmental perspective. *Developmental Review*, 12(4), 339–373. [http://dx.doi.org/10.1016/0273-2297\(92\)90013-R](http://dx.doi.org/10.1016/0273-2297(92)90013-R).
- Baekeland, F., & Lundwall, L. (1975). Dropping out of treatment: A critical review. *Psychological Bulletin*, 82(5), 738–783. <http://dx.doi.org/10.1037/h0077132>.
- Baldwin, S. A., Wampold, B. E., & Imel, Z. E. (2007). Untangling the alliance-outcome correlation: Exploring the relative importance of therapist and patient variability in the alliance. *Journal of Consulting and Clinical Psychology*, 75(6), 842–852. <http://dx.doi.org/10.1037/0022-006X.75.6.842>.
- Barber, J., Luborsky, L., Crits-Christoph, P., Thase, M., Weiss, R., Frank, A., et al. (1999). Therapeutic alliance as a predictor of outcome in treatment of cocaine dependence. *Psychotherapy Research*, 9(1), 54–73. <http://dx.doi.org/10.1080/10503309912331332591>.
- Bateman, A., & Fonagy, P. (2008). Comorbid antisocial and borderline personality disorders: mentalization-based treatment. *Journal of Clinical Psychology*, 64(2), 181–194. <http://dx.doi.org/10.1002/jclp.20451>.
- Berg, J. E. (2009). *Use of a sense of coherence test and Hopkins Symptom Checklist to predict completion of stay in a postdetoxification counseling unit*. research-article. (Retrieved 27 November 2010, from <http://informahealthcare.com/doi/abs/10.3109/10550499608995684>).
- Beynon, C. M., Bellis, M. A., & McVeigh, J. (2006). Trends in drop out, drug free discharge and rates of re-presentation: a retrospective cohort study of drug treatment clients in the North West of England. *BMC Public Health*, 6, 205–205. <http://dx.doi.org/10.1186/1471-2458-6-205>.
- Beynon, C. M., McMinn, A. M., & Marr, A. J. (2008). Factors predicting drop out from, and retention in, specialist drug treatment services: A case control study in the North West of England. *BMC Public Health*, 8, 149. <http://dx.doi.org/10.1186/1471-2458-8-149>.
- Blondell, R. D., Amadasu, A., Servoss, T. J., & Smith, S. J. (2006). Differences among those who complete and fail to complete inpatient detoxification. *Journal of Addictive Diseases*, 25(1), 95–104. http://dx.doi.org/10.1300/j069v25n01_12.
- Blood, L., & Cornwall, A. (1994). Pretreatment variables that predict completion of an adolescent substance abuse treatment program. *The Journal of Nervous and Mental Disease*, 182(1), 14–19. <http://dx.doi.org/10.1097/00005053-199401000-00004>.
- Brady, K. T., Dansky, B. S., Back, S. E., Foa, E. B., & Carroll, K. M. (2001). Exposure therapy in the treatment of PTSD among cocaine-dependent individuals: Preliminary findings. *Journal of Substance Abuse Treatment*, 21(1), 47–54. [http://dx.doi.org/10.1016/S0740-5472\(01\)00182-9](http://dx.doi.org/10.1016/S0740-5472(01)00182-9).
- Brecht, M. L., Greenwell, L., & Anglin, M. D. (2005). Methamphetamine treatment: trends and predictors of retention and completion in a large state treatment system (1992–2002). *Journal of Substance Abuse Treatment*, 29(4), 295–306. <http://dx.doi.org/10.1016/j.jsat.2005.08.012>.
- Brener, L., Von Hippel, W., Von Hippel, C., Resnick, I., & Treloar, C. (2010). Perceptions of discriminatory treatment by staff as predictors of drug treatment completion: Utility of a mixed methods approach. *Drug and Alcohol Review*, 29(5), 491–497. <http://dx.doi.org/10.1111/j.1465-3362.2010.00173.x>.
- Brewer, D. D., Catalano, R. F., Haggerty, K., Gainey, R. R., & Fleming, C. B. (1998). RESEARCH REPORT A meta-analysis of predictors of continued drug use during and after treatment for opiate addiction. *Addiction*, 93(1), 73–92. <http://dx.doi.org/10.1046/j.1360-0443.1998.931738.x>.
- Callaghan, R. C. (2003). Risk factors associated with dropout and readmission among First Nations individuals admitted to an inpatient alcohol and drug detoxification program. *CMAJ*, 169(1), 23–27.
- Callaghan, R. C., & Cunningham, J. A. (2002). Gender differences in detoxification: predictors of completion and re-admission. *Journal of Substance Abuse Treatment*, 23(4), 399–407. [http://dx.doi.org/10.1016/S0740-5472\(02\)00302-1](http://dx.doi.org/10.1016/S0740-5472(02)00302-1).
- Callaghan, R. C., Hathaway, A., Cunningham, J. A., Vettese, L. C., Wyatt, S., & Taylor, L. (2005). Does stage-of-change predict dropout in a culturally diverse sample of adolescents admitted to inpatient substance-abuse treatment? A test of the Transtheoretical Model. *Addictive Behaviors*, 30(9), 1834–1847. <http://dx.doi.org/10.1016/j.addbeh.2005.07.015>.
- Chawdhary, A., Sayre, S. L., Green, C., Schmitz, J. M., Grabowski, J., & Mooney, M. E. (2007). Moderators of delay tolerance in treatment-seeking cocaine users. *Addictive Behaviors*, 32(2), 370–376. <http://dx.doi.org/10.1016/j.addbeh.2006.03.044>.
- Claus, R. E., & Kindlerberger, L. R. (2002). Engaging substance abusers after centralized assessment: Predictors of treatment entry and dropout. *Journal of Psychoactive Drugs*, 34(1), 25–31.
- Condelli, W. S., Koch, M. A., & Fletcher, B. (2000). Treatment refusal/attrition among adults randomly assigned to programs at a drug treatment campus The New Jersey Substance Abuse Treatment Campus, Seacaucus, NJ. *Journal of Substance Abuse Treatment*, 18(4), 395–407. [http://dx.doi.org/10.1016/S0740-5472\(99\)00086-0](http://dx.doi.org/10.1016/S0740-5472(99)00086-0).
- Coolidge, F. L., Thede, L. L., & Jang, K. L. (2004). Are personality disorders psychological manifestations of executive function deficits? Bivariate heritability evidence from a twin study. *Behavior Genetics*, 34(1), 75–84.
- Cordaro, M., Tubman, J. G., Wagner, E. F., & Morris, S. L. (2012). Treatment process predictors of program completion or dropout among minority adolescents enrolled in a brief motivational substance abuse intervention. *Journal of Child & Adolescent Substance Abuse*, 21(1), 51–68. <http://dx.doi.org/10.1080/1067828X.2012.636697>.
- Cournoyer, L.-G., Brochu, S., Landry, M., & Bergeron, J. (2007). Therapeutic alliance, patient behaviour and dropout in a drug rehabilitation programme: The moderating effect of clinical subpopulations. *Addiction*, 102(12), 1960–1970. <http://dx.doi.org/10.1111/j.1360-0443.2007.02027.x>.
- Coviello, D. M., Alterman, A. I., Rutherford, M. J., Cacciola, J. S., McKay, J. R., & Zanis, D. A. (2001). The effectiveness of two intensities of psychosocial treatment for cocaine dependence. *Drug and Alcohol Dependence*, 61(2), 145–154. [http://dx.doi.org/10.1016/S0376-8716\(00\)00136-8](http://dx.doi.org/10.1016/S0376-8716(00)00136-8).
- Craig, R. J., & Olson, R. E. (2004). Predicting methadone maintenance treatment outcomes using the Addiction Severity Index and the MMPI-2 content scales (negative Treatment indicators and cynism scales). *The American Journal of Drug and Alcohol Abuse*, 30(4), 823–839. <http://dx.doi.org/10.1081/ADA-200037548>.
- Craig, R. J. (1985). Reducing the treatment drop out rate in drug abuse programs. *Journal of Substance Abuse Treatment*, 2(4), 209–219. [http://dx.doi.org/10.1016/0740-5472\(85\)90003-0](http://dx.doi.org/10.1016/0740-5472(85)90003-0).
- Crits-Christoph, P., Gibbons, M. B. C., Crits-Christoph, K., Narducci, J., Schamberger, M., & Gallop, R. (2006). Can therapists be trained to improve their alliances? A preliminary study of alliance-fostering psychotherapy. *Psychotherapy Research*, 16(3), 268–281. <http://dx.doi.org/10.1080/10503300500268557>.
- Curran, G. M., Kirchner, J. E., Worley, M., Rookey, C., & Booth, B. M. (2002). Depressive symptomatology and early attrition from intensive outpatient substance use treatment. *The Journal of Behavioral Health Services & Research*, 29(2), 138–143. <http://dx.doi.org/10.1007/BF02287700>.
- Curran, G. M., Stecker, T., Han, X., & Booth, B. M. (2009). Individual and program predictors of attrition from VA substance use treatment. *The Journal of Behavioral Health Services & Research*, 36(1), 25–34. <http://dx.doi.org/10.1007/s11414-007-9093-z>.
- Dakof, G. A., Tejada, M., & Liddle, H. A. (2001). Predictors of engagement in adolescent drug abuse treatment. *Journal of the American Academy of Child & Adolescent Psychiatry*, 40(3), 274–281. <http://dx.doi.org/10.1097/00004583-200103000-00006>.
- Dalsbø, T. K., Hammerstrøm, K. T., Vist, G. E., Gjermo, H., Smedslund, G., Steiro, A., et al. (2010). Psychosocial interventions for retention in drug abuse treatment. *Cochrane Database of Systematic Reviews*(1). <http://dx.doi.org/10.1002/14651858.CD008220>.
- Darke, S., Campbell, G., & Pople, G. (2012). Retention, early dropout and treatment completion among therapeutic community admissions. *Drug and Alcohol Review*, 31(1), 64–71. <http://dx.doi.org/10.1111/j.1465-3362.2011.00298.x>.
- Daughters, S. B., Richards, J. M., Gorka, S. M., & Sinha, R. (2009). HPA axis response to psychological stress and treatment retention in residential substance abuse treatment: A prospective study. *Drug and Alcohol Dependence*, 105(3), 202–208. <http://dx.doi.org/10.1016/j.drugalcdep.2009.06.026>.
- Davis, S. (2009). *Drug treatment decisions of chemically-dependent women*. research-article. (Retrieved 5 November 2010, from <http://informahealthcare.com/doi/abs/10.3109/10826089409047943>).
- De los Cobos, J. P., Trujols, J., Ribalta, E., & Casas, M. (1997). Cocaine use immediately prior to entry in an inpatient heroin detoxification unit as a predictor of discharges against medical advice. *The American Journal of Drug and Alcohol Abuse*, 23(2), 267–279.
- De Weert-van Oene, G. H., Burger, H., Grobbee, D. E., & Schrijvers, A. J. P. (2007). Identification of patients at high risk of noncompliance in substance dependence treatment. *European Addiction Research*, 13(2), 74–80. <http://dx.doi.org/10.1159/000097936>.
- De Weert-Van Oene, G. H., Schippers, G. M., De Jong, C. A. J., & Schrijvers, G. J. P. (2001). Retention in substance dependence treatment: The relevance of in-treatment factors. *Journal of Substance Abuse Treatment*, 20(4), 253–261. [http://dx.doi.org/10.1016/S0740-5472\(01\)00160-X](http://dx.doi.org/10.1016/S0740-5472(01)00160-X).

- Deane, F., Wootton, D., Hsu, C. -I., & Kelly, P. (2012). Predicting dropout in the first 3 months of 12-step residential drug and alcohol treatment in an Australian sample. *Faculty of Health and Behavioural Sciences - Papers (Archive)* (pp. 216–225).
- Dobkin, P. L., Civita, M. D., Paraherakis, A., & Gill, K. (2002). The role of functional social support in treatment retention and outcomes among outpatient adult substance abusers. *Addiction*, 97(3), 347–356. <http://dx.doi.org/10.1046/j.1360-0443.2002.00083.x>.
- Doumas, D. M., Blasey, C. M., & Thacker, C. L. (2005). Attrition from alcohol and drug outpatient treatment. *Alcoholism Treatment Quarterly*, 23(4), 55–67. http://dx.doi.org/10.1300/J020v23n04_04.
- Dziedzic, A., London, M., & Tilbury, J. (1998). A controlled comparison of cognitive behavioural and traditional counselling in a methadone tapering programme. *Clinical Psychology & Psychotherapy*, 5(1), 47–53. [http://dx.doi.org/10.1002/\(SICI\)1099-0879\(199803\)5:1<47::AID-PPP149>3.0.CO;2-1](http://dx.doi.org/10.1002/(SICI)1099-0879(199803)5:1<47::AID-PPP149>3.0.CO;2-1).
- Eaton, L. (2004). Numbers starting treatment for drug misuse increase by 20% over two years. *BMJ: British Medical Journal*, 329(7474), 1066. <http://dx.doi.org/10.1136/bmj.329.7474.1066-e>.
- Fernandez-Montalvo, J., & López-Goñi, J. J. (2010). Comparison of completers and dropouts in psychological treatment for cocaine addiction. *Addiction Research & Theory*, 18(4), 433–441. <http://dx.doi.org/10.3109/16066350903324826>.
- Fishman, J., Reynolds, T., & Riedel, E. (1999). A retrospective investigation of an intensive outpatient substance abuse treatment program. *The American Journal of Drug and Alcohol Abuse*, 25(2), 185–196. <http://dx.doi.org/10.1081/ADA-100101854>.
- Ford, M. R., & Widiger, T. A. (1989). Sex bias in the diagnosis of histrionic and antisocial personality disorders. *Journal of Consulting and Clinical Psychology*, 57(2), 301. <http://dx.doi.org/10.1037/0022-006X.57.2.301>.
- Fowler, J. C., Groat, M., & Ulanday, M. (2013). Attachment style and treatment completion among psychiatric inpatients with substance use disorders. *The American Journal on Addictions*, 22(1), 14–17. <http://dx.doi.org/10.1111/j.1521-0391.2013.00318.x>.
- Fuster, J. M. (1989). *The prefrontal cortex* (2nd ed.) New York: Raven Press.
- Gelso, C. J., & Carter, J. A. (1994). Components of the psychotherapy relationship: Their interaction and unfolding during treatment. *Journal of Counseling Psychology*, 41(3), 296–306. <http://dx.doi.org/10.1037/0022-0167.41.3.296>.
- Gilchrist, G., Langohr, K., Fonseca, F., Muga, R., & Torrens, M. (2012). Factors associated with discharge against medical advice from an alcohol and drug inpatient detoxification unit in Barcelona between 1993 and 2006. Retrieved from <http://upcommons.upc.edu/handle/2117/15733>
- Giyaur, K., Sharf, J., & Hilsenroth, M. J. (2005). The capacity for dynamic process scale (CDPS) and patient engagement in opiate addiction treatment. *The Journal of Nervous and Mental Disease*, 193(12), 833–838. <http://dx.doi.org/10.1097/01.nmd.0000188978.50765.39>.
- Hansen, N. B., & Lambert, M. J. (2003). An evaluation of the dose–response relationship in naturalistic treatment settings using survival analysis. *Mental Health Services Research*, 5(1), 1–12. <http://dx.doi.org/10.1023/A:1021751307358>.
- Hawkins, E. J., Baer, J. S., & Kivlahan, D. R. (2008). Concurrent monitoring of psychological distress and satisfaction measures as predictors of addiction treatment retention. *Journal of Substance Abuse Treatment*, 35(2), 207–216. <http://dx.doi.org/10.1016/j.jsat.2007.10.001>.
- Helmus, T. C., Downey, K. K., Arfken, C. L., Henderson, M. J., & Schuster, C. R. (2001). Novelty seeking as a predictor of treatment retention for heroin dependent cocaine users. *Drug and Alcohol Dependence*, 61(3), 287–295. [http://dx.doi.org/10.1016/S0376-8716\(00\)00153-8](http://dx.doi.org/10.1016/S0376-8716(00)00153-8).
- Hien, D. A., Nunes, E., Levin, F. R., & Fraser, D. (2000). Posttraumatic stress disorder and short-term outcome in early methadone treatment. *Journal of Substance Abuse Treatment*, 19(1), 31–37. [http://dx.doi.org/10.1016/S0740-5472\(99\)00088-4](http://dx.doi.org/10.1016/S0740-5472(99)00088-4).
- Hoffman, J. A., Caudill, B. D., Koman, J. J., Luckey, J. W., Flynn, P. M., & Hubbard, R. L. (1994). Comparative cocaine abuse treatment strategies: Enhancing client retention and treatment exposure. *Journal of Addictive Diseases*, 13(4), 115–128. http://dx.doi.org/10.1300/J069v13n04_01.
- Horvath, A. O., & Bedi, R. P. (2002). The alliance. In J. C. Norcross (Ed.), *Psychotherapy relationships that work* (pp. 37–70). New York: Oxford University Press.
- Horvath, A. O., & Symonds, B. D. (1991). Relation between working alliance and outcome in psychotherapy: A meta-analysis. *Journal of Counseling Psychology*, 38(2), 139–149. <http://dx.doi.org/10.1037/0022-0167.38.2.139>.
- Howard, K. I., Kopta, M. S., Krause, M. S., & Orlinsky, D. E. (1986). The dose–effect relationship in psychotherapy. *American Psychologist*, 41(2), 159–164. <http://dx.doi.org/10.1037/0003-066X.41.2.159>.
- Ioannidis, J. P. A. (2005). Why most published research findings are false. *PLoS Med*, 2(8), e124. <http://dx.doi.org/10.1371/journal.pmed.0020124>.
- Kampman, K. M., Alterman, A. I., Volpicelli, J. R., Maany, I., Muller, E. S., Luce, D. D., et al. (2001). Cocaine withdrawal symptoms and initial urine toxicology results predict treatment attrition in outpatient cocaine dependence treatment. *Psychology of Addictive Behaviors*, 15(1), 52–59. <http://dx.doi.org/10.1037/0893-164X.15.1.52>.
- Kay-Lambkin, F., Baker, A., Lewin, T., & Carr, V. (2011). Acceptability of a clinician-assisted computerized psychological intervention for comorbid mental health and substance use problems: Treatment adherence data from a randomized controlled trial. *Journal of Medical Internet Research*, 13(1). <http://dx.doi.org/10.2196/jmir.1522>.
- Kelly, J. F., & Moos, R. (2003). Dropout from 12-step self-help groups: prevalence, predictors, and counteracting treatment influences. *Journal of Substance Abuse Treatment*, 24(3), 241–250. [http://dx.doi.org/10.1016/S0740-5472\(03\)00021-7](http://dx.doi.org/10.1016/S0740-5472(03)00021-7).
- Kelly, S., Epstein, E. E., & McCrady, B. S. (2004). Pretreatment attrition from couple therapy for male drug abusers. *The American Journal of Drug and Alcohol Abuse*, 30(1), 1–19. <http://dx.doi.org/10.1081/ADA-120029861>.
- Kenne, D. R., Boros, A. P., & Fischbein, R. L. (2010b). Characteristics of opiate users leaving detoxification treatment against medical advice. *Journal of Addictive Diseases*, 29(3), 383–394. <http://dx.doi.org/10.1080/10550887.2010.489452>.
- King, A. C., & Canada, S. A. (2004). Client-related predictors of early treatment drop-out in a substance abuse clinic exclusively employing individual therapy. *Journal of Substance Abuse Treatment*, 26(3), 189–195. [http://dx.doi.org/10.1016/S0740-5472\(03\)00210-1](http://dx.doi.org/10.1016/S0740-5472(03)00210-1).
- Landry, M. J. (1996). *Overview of addiction treatment effectiveness*. DIANE Publishing.
- Lejuez, C. W., Zvolensky, M. J., Daughters, S. B., Bornovalova, M. A., Paulson, A., Tull, M. T., et al. (2008). Anxiety sensitivity: A unique predictor of dropout among inner-city heroin and crack/cocaine users in residential substance use treatment. *Behaviour Research and Therapy*, 46(7), 811–818. <http://dx.doi.org/10.1016/j.brat.2008.03.010>.
- Levin, F. R., Evans, S. M., Vosburg, S. K., Horton, T., Brooks, D., & Ng, J. (2004). Impact of attention-deficit hyperactivity disorder and other psychopathology on treatment retention among cocaine abusers in a therapeutic community. *Addictive Behaviors*, 29(9), 1875–1882. <http://dx.doi.org/10.1016/j.addbeh.2004.03.041>.
- Li, X., Sun, H., Purl, A., Marsh, D. C., & Anis, A. H. (2007). Factors associated with pretreatment and treatment dropouts among clients admitted to medical withdrawal management. *Journal of Addictive Diseases*, 26(3), 77–85. http://dx.doi.org/10.1300/J069v26n03_08.
- Lin, H.-C., Chen, K.-Y., Wang, P.-W., Yen, C.-F., Wu, H.-C., Yen, C.-N., et al. (2013). Predictors for Dropping-Out From Methadone Maintenance Therapy Programs Among Heroin Users in Southern Taiwan. *Substance Use & Misuse*, 48(1–2), 181–191. <http://dx.doi.org/10.3109/10826084.2012.749411>.
- López-Goñi, J. J., Fernández-Montalvo, J., Illescas, C., Landa, N., & Lorea, I. (2008). Determining socio-demographic predictors of treatment dropout: Results in a therapeutic community. *International Journal of Social Welfare*, 17(4), 374–378. <http://dx.doi.org/10.1111/j.1468-2397.2008.00584.x>.
- López-Goñi, J. J., Fernández-Montalvo, J., & Artega, A. (2012). Addiction treatment dropout: Exploring patients' characteristics. *The American Journal on Addictions*, 21(1), 78–85. <http://dx.doi.org/10.1111/j.1521-0391.2011.00188.x>.
- Lovaglia, M. J., & Matano, R. (1994). Research note predicting attrition from substance misuse treatment using the inventory of interpersonal problems. *Substance Use & Misuse*, 29, 105–113. <http://dx.doi.org/10.3109/10826089409047371>.
- Luty, J. (2003). What works in drug addiction? *Advances in Psychiatric Treatment*, 9(4), 280–288. <http://dx.doi.org/10.1192/apt.9.4.280>.
- MacKinnon, D. P., & Luecken, L. J. (2008). How and for whom? Mediation and moderation in health psychology. *Health Psychology*, 27(2 Suppl.), S99–S100. [http://dx.doi.org/10.1037/0278-6133.27.2\(Suppl.\).S99](http://dx.doi.org/10.1037/0278-6133.27.2(Suppl.).S99).
- Maglione, M., Chao, B., & Anglin, D. (2009). Residential treatment of methamphetamine users: correlates of drop-out from the california alcohol and drug data system (Cadds), 1994–1997. research-article. (Retrieved 26 November 2010, from <http://informahealthcare.com/doi/abs/10.3109/16066350009004410>).
- Marissen, M. A. E., Franken, I. H. A., Blanken, P., van den Brink, W., & Hendriks, V. M. (2007). Cue exposure therapy for the treatment of opiate addiction: Results of a randomized controlled clinical trial. *Psychotherapy and Psychosomatics*, 76(2), 97–105. <http://dx.doi.org/10.1159/000097968>.
- Marrero, C. A., Robles, R. R., Colón, H. M., Reyes, J. C., Matos, T. D., Sahai, H., et al. (2005). Factors associated with drug treatment dropout among injection drug users in Puerto Rico. *Addictive Behaviors*, 30(2), 397–402. <http://dx.doi.org/10.1016/j.addbeh.2004.05.024>.
- Mathers, C., Stevens, G., & Mascarenhas, M. (2009). *Global health risks: Mortality and burden of disease attributable to selected major risks*. World Health Organization (Retrieved from http://www.google.com/books?hl=no&lr=&id=Ycbr2e2WPdC&oi=fnd&pg=PR5&dq=Global+Health+Risks:+Mortality+and+Burden+of+Disease+Attributable+to+Selected+Major+Risks&ots=aeE-UvUhr&sig=HnOf6moJb3yOAOuej4dwe_F6y4).
- McHugh, R. K., Murray, H. W., Hearon, B. A., Pratt, E. M., Pollack, M. H., Safren, S. A., et al. (2013). Predictors of dropout from psychosocial treatment in opioid-dependent outpatients. *The American Journal on Addictions/American Academy of Psychiatrists in Alcoholism and Addictions*, 22(1), 18–22. <http://dx.doi.org/10.1111/j.1521-0391.2013.00317.x>.
- McKellar, J., Kelly, J., Harris, A., & Moos, R. (2006). Pretreatment and during treatment risk factors for dropout among patients with substance use disorders. *Addictive Behaviors*, 31(3), 450–460. <http://dx.doi.org/10.1016/j.addbeh.2005.05.024>.
- McLellan, A. T., Luborsky, L., Woody, G., & Goebel, L. (1988). Is the counselor an 'active ingredient' in substance abuse rehabilitation? An examination of treatment success among four counselors. *NIDA Research Monograph Series*, 81. (pp. 242–250).
- McMahon, R. C., Kelley, A., & Kouzekanani, K. (1993). Personality and coping styles in the prediction of dropout from treatment for cocaine abuse. *Journal of Personality Assessment*, 61(1), 147–155. http://dx.doi.org/10.1207/s15327752jpa6101_11.
- Meier, P. S., Donmall, M. C., McElduff, P., Barrowclough, C., & Heller, R. F. (2006). The role of the early therapeutic alliance in predicting drug treatment dropout. *Drug and Alcohol Dependence*, 83(1), 57–64. <http://dx.doi.org/10.1016/j.drugaldep.2005.10.010>.
- Miller, N. S., Summers, G. L., & Gold, M. S. (1993). Cocaine dependence: Alcohol and other drug dependence and withdrawal characteristics. *Journal of Addictive Diseases*, 12(1), 25–35. http://dx.doi.org/10.1300/J069v12n01_03.
- Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *Annals of Internal Medicine*, 151(4), 264–269.
- Moos, R. H., Pettit, B., & Gruber, V. A. (1995). Characteristics and outcomes of three models of community residential care for abuse patients. *Journal of Substance Abuse*, 7(1), 99–116.
- Morgan, A. B., & Lilienfeld, S. O. (2000). A meta-analytic review of the relation between antisocial behavior and neuropsychological measures of executive function - A review. *Clinical Psychology Review*, 20(1), 113–136. [http://dx.doi.org/10.1016/S0272-7358\(98\)00096-8](http://dx.doi.org/10.1016/S0272-7358(98)00096-8).
- Mulvaney, F. D., Alterman, A. I., Boardman, C. R., & Kampman, K. (1999). Cocaine abstinence symptomatology and treatment attrition. *Journal of Substance Abuse Treatment*, 16(2), 129–135. [http://dx.doi.org/10.1016/S0740-5472\(98\)00017-8](http://dx.doi.org/10.1016/S0740-5472(98)00017-8).
- Murphy, P. N., & Bental, R. P. (1999). Opiate withdrawal outcome: The predictive ability of admission measures from the family assessment device (F.A.D.). *Substance Use & Misuse*, 34(2), 307–316.
- Nellori, N., & Ernst, F. (2004). Predictors of treatment completion for patients receiving residential drug and alcohol treatment. *Addictive Disorders & Their Treatment*, 3(1), 36. <http://dx.doi.org/10.1097/00132576-200403000-00005>.

- Noel, P. E. (2006). The impact of therapeutic case management on participation in adolescent substance abuse treatment. *The American Journal of Drug and Alcohol Abuse*, 32(3), 311–327. <http://dx.doi.org/10.1080/00952990500328646>.
- O'Neill, M. L., Lidz, V., & Heilbrun, K. (2003). Adolescents with psychopathic characteristics in a substance abusing cohort: Treatment process and outcomes. *Law and Human Behavior*, 27(3), 299–313. <http://dx.doi.org/10.1023/A:1023435924569>.
- Orlinsky, D. E., Rønnestad, M. H., & Willutzki, U. (2004). Fifty years of psychotherapy process-outcome research: Continuity and change. *Bergin and Garfield's handbook of psychotherapy and behavior change*, Vol. 5. (pp. 307–390).
- Oxman, A. D., & Guyatt, G. H. (1993). The science of reviewing research. *Annals of the New York Academy of Sciences*, 703(1), 125–134. <http://dx.doi.org/10.1111/j.1749-6632.1993.tb26342.x>.
- Pagnin, D., de Queiroz, V., & Saggese, E. G. (2005). Predictors of attrition from day treatment of adolescents with substance-related disorders. *Addictive Behaviors*, 30(5), 1065–1069. <http://dx.doi.org/10.1016/j.addbeh.2004.09.013>.
- Palmer, J. A., Palmer, L. K., & Williamson, D. (1995). Childhood abuse as a factor in attrition from drug rehabilitation. *Psychological Reports*, 76(3 Pt 1), 879–882. <http://dx.doi.org/10.2466/pr0.1995.76.3.879>.
- Passos, S. R. L., & Camacho, L. A. B. (2000). Factors associated with immediate dropout of outpatient treatment for drug abuse in Rio de Janeiro. *Social Psychiatry and Psychiatric Epidemiology*, 35(11), 513–517. <http://dx.doi.org/10.1007/s001270050273>.
- Patkar, A. A., Murray, H. W., Mannelli, P., Gottheit, E., Weinstein, S. P., & Vergare, M. J. (2004). Pre-treatment measures of impulsivity, aggression and sensation seeking are associated with treatment outcome for African-American cocaine-dependent patients. *Journal of Addictive Diseases*, 23(2), 109–122. http://dx.doi.org/10.1300/J069v23n02_08.
- Patkar, A. A., Thornton, C. C., Mannelli, P., Hill, K. P., Gottheit, E., Vergare, M. J., et al. (2004). Comparison of pretreatment characteristics and treatment outcomes for alcohol-, cocaine-, and multisubstance-dependent patients. *Journal of Addictive Diseases*, 23(1), 93–109. http://dx.doi.org/10.1300/J069v23n01_08.
- Pedersen, M. U. (2007). Women in residential drug-free treatment: How to use a bottom-up strategy and a prediction of completion instrument to prevent early dropout. *therapeutic communities*, 28(1), 45.
- Petry, N. M., & Bickel, W. K. (2000). Gender differences in hostility of opioid-dependent outpatients: Role in early treatment termination. *Drug and Alcohol Dependence*, 58(1–2), 27–33. [http://dx.doi.org/10.1016/S0376-8716\(99\)00058-7](http://dx.doi.org/10.1016/S0376-8716(99)00058-7).
- Pettinati, H. M., Meyers, K., Jensen, J. M., Kaplan, F., & Evans, B. D. (1993). Inpatient vs outpatient treatment for substance dependence revisited. *Psychiatric Quarterly*, 64(2), 173–182. <http://dx.doi.org/10.1007/BF01065868>.
- Pouloupoulos, C. (1999). Socio-demographic differences, patterns of use and drop-out from greek drug-free treatment programmes. *Drugs: Education, Prevention, and Policy*, 6(1), 99–110. <http://dx.doi.org/10.1080/09687639997322>.
- Ravndal, E., & Vaglum, P. (1994). Self-reported depression as a predictor of dropout in a hierarchical therapeutic community. *Journal of Substance Abuse Treatment*, 11(5), 471–479. [http://dx.doi.org/10.1016/0740-5472\(94\)90101-5](http://dx.doi.org/10.1016/0740-5472(94)90101-5).
- Ravndal, E., Vaglum, P., & Lauritzen, G. (2005). Completion of long-term inpatient treatment of drug abusers: A prospective study from 13 different units. *European Addiction Research*, 11(4), 180–185. <http://dx.doi.org/10.1159/000086399>.
- Rawson, R. A., Gonzales, R., Obert, J. L., McCann, M. J., & Brethen, P. (2005). Methamphetamine use among treatment-seeking adolescents in Southern California: Participant characteristics and treatment response. *Journal of Substance Abuse Treatment*, 29(2), 67–74. <http://dx.doi.org/10.1016/j.jsat.2005.04.001>.
- Raylu, N., & Kaur, I. (2012). Relationships between treatment expectations and treatment outcomes among outpatients with substance use problems. *International Journal of Mental Health and Addiction*, 10(5), 607–621.
- Robbins, M. S., Liddle, H. A., Turner, C. W., Dakof, G. A., Alexander, J. F., & Kogan, S. M. (2006). Adolescent and parent therapeutic alliances as predictors of dropout in multidimensional family therapy. *Journal of Family Psychology*, 20(1), 108. <http://dx.doi.org/10.1037/0893-3200.20.1.108>.
- Roffman, R. A., Klepsch, R., Wertz, J. S., Simpson, E. E., & Stephens, R. S. (1993). Predictors of attrition from an outpatient marijuana-dependence counseling program. *Addictive Behaviors*, 18(5), 553–566. [http://dx.doi.org/10.1016/0306-4603\(93\)90071-G](http://dx.doi.org/10.1016/0306-4603(93)90071-G).
- Rohsenow, D. J., Martin, R. A., Eaton, C. A., & Monti, P. M. (2007). Cocaine craving as a predictor of treatment attrition and outcomes after residential treatment for cocaine dependence. *Journal of Studies on Alcohol and Drugs*, 68(5) (Retrieved from http://www.jsad.com/jsad/article/Cocaine_Craving_as_a_Predictor_of_Treatment_Attrition_and_Outcomes_After_Re/2163.html).
- Roizen, R. (1993). *Merging Alcohol and Illicit Drugs: A Brief Commentary on the Search for Symbolic Middle Ground Between Licit and Illicit Psychoactive Substances*. (Unpublished paper. Retrieved from <http://www.roizen.com/ron/merger.htm>).
- Romer, D. (2010). Adolescent risk taking, impulsivity, and brain development: Implications for prevention. *Developmental Psychobiology*, 52(3), 263–276. <http://dx.doi.org/10.1002/dev.20442>.
- Ross, H. E., Cutler, M., & Sklar, S. M. (1997). Retention in substance abuse treatment: Role of psychiatric symptom severity. *American Journal on Addictions*, 6(4), 293–303. <http://dx.doi.org/10.3109/10550499709005060>.
- Saarnio, P., & Knuutila, V. (2003). A study of risk factors in dropping out from inpatient treatment of substance abuse. *Journal of Substance Use*, 8(1), 33–38. <http://dx.doi.org/10.1080/1465989031000067227>.
- Salamina, G., Diecidue, R., Vigna-Taglianti, F., Jarre, P., Schifano, P., Bargagli, A. M. The VEdeTTE Study Group (2010). Effectiveness of therapies for heroin addiction in retaining patients in treatment: Results from the VEdeTTE study. *Substance Use & Misuse*, 45(12), 2076–2092. <http://dx.doi.org/10.3109/10826081003791932>.
- Salekin, R. T., Rogers, R., & Sewell, K. W. (1997). Construct validity of psychopathy in a female offender sample: A multitrait-multimethod evaluation. *Journal of abnormal psychology*, 106, 576–585.
- Samuel, D. B., LaPaglia, D. M., Maccarelli, L. M., Moore, B. A., & Ball, S. A. (2011). Personality disorders and retention in a therapeutic community for substance dependence. *The American Journal on Addictions*, 20(6), 555–562.
- Santonja-Gómez, F. -J., Sánchez-Hervás, E., Secades-Villa, R., Zacarés-Romaguera, F., García-Rodríguez, O., & García-Fernández, G. (2010). Pretreatment characteristics as predictors of retention in cocaine-dependent outpatients. *Addictive Disorders & Their Treatment*, 9(2), 93–98. <http://dx.doi.org/10.1097/ADT.0b013e3181bf77ec>.
- Sayre, S. L., Schmitz, J. M., Stotts, A. L., Averill, P. M., Rhoades, H. M., & Grabowski, J. J. (2002). Determining predictors of attrition in an outpatient substance abuse program. research-article. (Retrieved 5 November 2010, from <http://informahealthcare.com/doi/abs/10.1081/ADA-120001281>).
- Scott-Lennox, J., Rose, R., Bohliger, A., & Lennox, R. (2000). The impact of women's family status on completion of substance abuse treatment. *The Journal of Behavioral Health Services & Research*, 27(4), 366–379. <http://dx.doi.org/10.1007/BF02287819>.
- Shaffer, H. J., LaPlante, D. A., LaBrie, R. A., Kidman, R. C., Donato, A. N., & Stanton, M. V. (2004). Toward a syndrome model of addiction: Multiple expressions, common etiology. *Harvard review of psychiatry*, 12(6), 367–374.
- Shelef, K., Diamond, G. M., Diamond, G. S., & Liddle, H. A. (2005). Adolescent and parent alliance and treatment outcome in multidimensional family therapy. *Journal of Consulting and Clinical Psychology*, 73(4), 689. <http://dx.doi.org/10.1037/0022-006X.73.4.689>.
- Simons, L. (2008). Characteristics of drug-abusing women with children in residential treatment: A preliminary evaluation of program retention and treatment completion. *Journal of Ethnicity in Substance Abuse*, 7(2), 165–187. <http://dx.doi.org/10.1080/15332640802055616>.
- Simpson, D. D. (1979). The relation of time spent in drug abuse treatment to posttreatment outcome. *The American Journal of Psychiatry*, 136(11), 1449–1453.
- Simpson, D. D. (1981). Treatment for drug abuse: Follow-up outcomes and length of time spent. *Archives of General Psychiatry*, 38(8), 875–880. <http://dx.doi.org/10.1001/archpsyc.1981.01780330033003>.
- Simpson, D. D., Joe, G. W., Rowan-Szal, G. A., & Greener, J. M. (1997). Drug abuse treatment process components that improve retention. *Journal of Substance Abuse Treatment*, 14(6), 565–572. [http://dx.doi.org/10.1016/S0740-5472\(97\)00181-5](http://dx.doi.org/10.1016/S0740-5472(97)00181-5).
- Siqueland, L., Crits-Christoph, P., Gallop, R., Barber, J. P., Griffin, M. L., Thase, M. E., et al. (2002). Retention in psychosocial treatment of cocaine dependence: Predictors and impact on outcome. *American Journal on Addictions*, 11(1), 24–40. <http://dx.doi.org/10.1080/10550490252801611>.
- Slesnick, N. (2001). Variables associated with therapy attendance in runaway substance abusing youth: Preliminary findings. *American Journal of Family Therapy*, 29(5), 411–420.
- Smith, E. M., North, C. S., & Fox, L. W. (1996). Eighteen-month follow-up data on a treatment program for homeless substance abusing mothers. *Journal of Addictive Diseases*, 14(4), 57–72. http://dx.doi.org/10.1300/J069v14n04_04.
- Smyth, B. P., Fagan, J., & Kernan, K. (2012). Outcome of heroin-dependent adolescents presenting for opiate substitution treatment. *Journal of Substance Abuse Treatment*, 42(1), 35–44. <http://dx.doi.org/10.1016/j.jsat.2011.07.007>.
- Sosin, M. R., & Durkin, E. (2007). Perceptions about services and dropout from a substance abuse case management program. *Journal of Community Psychology*, 35(5), 583–602. <http://dx.doi.org/10.1002/jcop.20166>.
- Specka, M., Buchholz, A., Kuhlmann, T., Rist, F., & Scherbaum, N. (2011). Prediction of the outcome of inpatient opiate detoxification treatment: Results from a multicenter study. *European Addiction Research*, 17(4), 178–184.
- Srisuranont, M., Sombatmai, S., & Boripuntakul, T. (2007). Brief intervention for students with methamphetamine use disorders: A randomized controlled trial. *American Journal on Addictions*, 16(2), 111–116. <http://dx.doi.org/10.1080/10550490601184431>.
- Stark, M. J. (1992). Dropping out of substance abuse treatment: A clinically oriented review. *Clinical Psychology Review*, 12(1), 93–116. [http://dx.doi.org/10.1016/0272-7358\(92\)90092-M](http://dx.doi.org/10.1016/0272-7358(92)90092-M).
- Stevens, A., Radcliffe, P., Sanders, M., & Hunt, N. (2008). Early exit: Estimating and explaining early exit from drug treatment. *Harm Reduction Journal*, 5(1), 13. <http://dx.doi.org/10.1186/1477-7517-5-13>.
- Streeter, C. C., Terhune, D. B., Whitfield, T. H., Gruber, S., Sarid-Segal, O., Silveri, M. M., et al. (2007). Performance on the troop predicts treatment compliance in cocaine-dependent individuals. *Neuropsychopharmacology*, 33(4), 827–836. <http://dx.doi.org/10.1038/sj.npp.1301465>.
- Teichner, G., Horner, M. D., Roitzsch, J. C., Herron, J., & Thevos, A. (2002). Substance abuse treatment outcomes for cognitively impaired and intact outpatients. *Addictive Behaviors*, 27(5), 751–763. [http://dx.doi.org/10.1016/S0306-4603\(01\)00207-6](http://dx.doi.org/10.1016/S0306-4603(01)00207-6).
- Thompson-Schill, S. L., Ramscar, M., & Chrysikou, E. G. (2009). Cognition without control: When a little frontal lobe goes a long way. *Current Directions in Psychological Science*, 18(5), 259–263. <http://dx.doi.org/10.1111/j.1467-8721.2009.01648.x>.
- UNODC (2012). *World Drug Report 2012*. Austria: United Nations (Retrieved from <http://www.unodc.org/unodc/en/data-and-analysis/WDR-2012.html>).
- Veach, L. J., Remley, T. P., Kippers, S. M., & Sorg, J. D. (2009). Retention predictors related to intensive outpatient programs for substance use disorders. research-article. (Retrieved 26 November 2010, from <http://informahealthcare.com/doi/abs/10.1081/ADA-100100253>).
- Vendetti, J., McRee, B., Miller, M., Christiansen, K., Herrell, J. The Marijuana Treatment Project Research Group (2002). Correlates of pre-treatment drop-out among persons with marijuana dependence. *Addiction*, 97, 125–134. <http://dx.doi.org/10.1046/j.1360-0443.97.s01.8.x>.
- Veneman, S., Leuchter, A., Bartzokis, G., Beckson, M., Simon, S. L., Schaefer, M., et al. (2006). Variation in neurophysiological function and evidence of quantitative electroencephalogram discordance: predicting cocaine-dependent treatment attrition. *J Neuropsychiatry Clin Neurosci*, 18(2), 208–216. <http://dx.doi.org/10.1176/appi.neuropsych.18.2.208>.
- Verheul, R., van den Brink, W., & Hartgers, C. (1995). Prevalence of personality disorders among alcoholics and drug addicts: An overview. *European Addiction Research*, 1(4), 166–177. <http://dx.doi.org/10.1159/000259080>.

- Walker, R. (2009). Retention in treatment-indicator or illusion: An Essay. *Substance use & misuse*, 44(1), 18–27.
- Wan, L., Baldridge, R. M., Colby, A. M., & Stanford, M. S. (2010). Association of P3 amplitude to treatment completion in substance dependent individuals. *Psychiatry Research*, 177(1–2), 223–227. <http://dx.doi.org/10.1016/j.psychres.2009.01.033>.
- Warden, D., Subramaniam, G. A., Carmody, T., Woody, G. E., Minhajuddin, A., Poole, S. A., et al. (2012). Predictors of attrition with buprenorphine/naloxone treatment in opioid dependent youth. *Addictive Behaviors*, 37(9), 1046–1053. <http://dx.doi.org/10.1016/j.addbeh.2012.04.011>.
- Weinstock, J., Alessi, S. M., & Petry, N. M. (2007). Regardless of psychiatric severity the addition of contingency management to standard treatment improves retention and drug use outcomes. *Drug and Alcohol Dependence*, 87(2–3), 288–296. <http://dx.doi.org/10.1016/j.drugalcdep.2006.08.027>.
- White, J. M., Winn, K. I., & Young, W. (1998). Predictors of attrition from an outpatient chemical dependency program. *Substance Abuse: Official Publication of the Association for Medical Education and Research in Substance Abuse*, 19(2), 49–59. <http://dx.doi.org/10.1080/08897079809511374>.
- WHO | ATLAS 2010: First global report on substance use disorders launched. (n.d.). (2010). WHO (Retrieved 12 June 2013, from http://www.who.int/substance_abuse/publications/Media/en/index.html).
- Wierzbicki, M., & Pekarik, G. (1993). A meta-analysis of psychotherapy dropout. *Professional Psychology: Research and Practice*, 24(2), 190–195. <http://dx.doi.org/10.1037/0735-7028.24.2.190>.
- Williams, R. J., & Chang, S. Y. (2000). A comprehensive and comparative review of adolescent substance abuse treatment outcome. *Clinical Psychology: Science and Practice*, 7(2), 138–166. <http://dx.doi.org/10.1093/clipsy.7.2.138>.
- Williamson, W. P., & Hood, R. W. (2012). The Lazarus Project: A longitudinal study of spiritual transformation among substance abusers. *Mental Health, Religion & Culture*, 15(6), 611–635. <http://dx.doi.org/10.1080/13674676.2011.608527>.
- Wilson, J. J., Levin, F. R., Donovan, S. J., & Nunes, E. V. (2006). Verbal abilities as predictors of retention among adolescents in a therapeutic community. *Child Psychiatry and Human Development*, 36(4), 393–401. <http://dx.doi.org/10.1007/s10578-006-0010-0>.
- Wintersteen, M. B., Mensinger, J. L., & Diamond, G. S. (2005). Do gender and racial differences between patient and therapist affect therapeutic alliance and treatment retention in adolescents? *Professional Psychology: Research and Practice*, 36(4), 400–408. <http://dx.doi.org/10.1037/0735-7028.36.4.400>.
- Öhlin, L., Hesse, M., Fridell, M., & Tätting, P. (2011). Poly-substance use and antisocial personality traits at admission predict cumulative retention in a buprenorphine programme with mandatory work and high compliance profile. *BMC Psychiatry*, 11(1), 81. <http://dx.doi.org/10.1186/1471-244X-11-81>.