Cat ownership and schizophrenia-related disorders and psychotic-like experiences: a systematic review and meta-analysis

Supplementary materials

Contents

eTable 1. Search string (e.g., PubMed/Medline)

Cat ownership and psychosis	
#1 ((schizophrenia [TIAB] OR paranoid schizophrenia [TIAB] OR schizophreniform [TIAB] OR schizoaffective [TIAB] OR schizotypal [TIAB] OR schizotypy [TIAB] OR psychosis [TIAB] OR psychotic [TIAB] OR psychotic disorder [TIAB] OR psychotic disorders [TIAB] OR delusion [TIAB] OR delusional disorder [TIAB] OR delusional disorders [TIAB] OR mental disorder [TIAB] OR mental disorders [TIAB] OR hallucination [TIAB] OR hallucinations [TIAB] OR psychotic experiences [TIAB] OR psychotic experience [TIAB] OR psychotic-like experiences [TIAB]) NOT (animal [TIAB]))	54,408
#2 ((Toxoplasmosis) OR (Toxoplasma gondii) OR (T. gondii) OR (cat) OR (cat ownership) OR (cats) OR (feline))	46,599
(#1 AND #2)	412

eTable 2. Quality score based on Newcastle - Ottawa Quality Assessment Scale

Case-control studies

First author, year, country	Q1	Q2	Q3	Q4	Comparability (adjusted for age, sex)	Q5	Q6	Q7	Total score
Ademe 2022, Ethiopia					**		*		3
Bedwell 2020, USA	*			*	*		*		4
El Mouhawass 2020, Lebanon		*	*		**		*		5
Hussein 2020, Egypt	*				**		*		4
Lindgren 2018, Finland	*	*	*	*	*	*	*		7
Oumaima unpublished, Tunisia	*			*	**		*		5
Hakami 2020, Saudi Arabia		*		*	**		*	*	6
Kezai 2020, France	*			*	**		*	*	6
Kolopako 2013, USA	*			*				*	3
Paquin 2022, Canada	*		*	*	**		*	*	7
Torrey 1995, USA				*			*		2
Torrey 2000, USA			*	*	**				4
Torrey 2015, USA									0
Yolken 2019, USA	*		*		*		*		4
Yuksel 2010, Turkey	*			*	**	*	*		6

Cohort studies (For three case-cohort studies, we used the same scale for cohort studies to assess their risk of bias)

First author, year, country	Q1	Q2	Q3	Q4	Comparability (adjusted for age, sex)	Q5	Q6	Q7	Total score
Solmi 2018, UK	*	*		*	**	*	*	*	8
Palomäki, 2019, Finland	*	*	*	*	*	*	*	*	8

Note: Q1-Q4 = selection variables, Q5-Q7 = Outcome variable

- If the authors stated that they used diagnostic criteria and chart diagnosis, it was sufficient to receive a star for Q1.
- For studies using psychotic-like experiences, usually assessed with multiple items and scored on a continuous scale (not a disease scale), for Q1, this was given a star ('independent validation of case definition'). And for Q4, a similar rule was applied. While technically they are not cases, the respondents have been assessed on the same scale and divided into low/high or present/absent etc.
- For comparability, many studies matched cases and controls on age and sex, thus receiving two stars for comparability. For cohort designs, these variables were assumed to be matched unless otherwise stated (the ALSPAC and Finnish surveys are based on birth cohorts).
- Volunteers and respondents from consumer/caregiver groups were considered as broadly representative of cases for the purposes of this scale, however these samples are often biased when compared to samples from population-based samples.
- For Q2 (representativeness of the cases), if the researchers used a probability or random sample of all hospital cases, this was given a star.

eTable 3. Summary table of the included studies

First author, year, country	Study design	Sample size	Case	Control	Diagnostic Criteria	Exposure	Outcome	Estimate type	Quality score*
Ademe,2022, Ethiopia	Case-control	94	47	47	NS	Cat contact	Schizophrenia	aOR	3
Mouhawass, 2020, Lebanon	Case-control	150	150	150	DSM-5	Cat contact	Schizophrenia	aOR	5
Oumaima, unpublished, Tunisia	Case-control	400	200	200	DSM-IV	Cat ownership	Psychosis	aOR	5
Oumaima, unpublished, Tunisia	Case-control	400	200	200	DSM-IV	Cat ownership	Psychosis	OR	5
Hakami, 2022, Saudi Arabia	Case-control	156	78	156	ICD-10	Cat ownership	Schizophrenia	OR	6
Hussein, 2020, Egypt	Case-control	103	53	50	DSM-IV-TR	Cat contact	Schizophrenia	OR	4
Kezai, 2020, Algeria	Case-control	140	70	70	DSM-5	Cat contact	Schizophrenia	OR	6
Torrey, 2000, USA	Case-control	792	264	528	NS	Cat ownership	Psychosis	OR	4
Torrey, 2000, USA	Case-control	792	264	528	NS	Cat ownership	Psychosis	aOR	4
Torrey, 2015, USA	Case-control	330	165	165	NS	Cat contact	Schizophrenia	OR	4
Torrey, 2015, USA	Case-control	784	262	522	NS	Cat ownership	Schizophrenia	OR	4
Torrey, 2015, USA	Case-control	6972	2125	4847	NS	Cat ownership	Schizophrenia	OR	4
Yolken, 2019, USA	Case-control	990	396	594	DSM-IV	Cat contact	Schizophrenia	aOR	4
Yuksel, 2010, Turkey	Case-control	600	300	300	DSM-IV	Cat contact	Schizophrenia	aRR	6
Yuksel, 2010, Turkey	Case-control	600	300	300	DSM-IV	Cat contact	Schizophrenia	OR, aOR	6
Bedwell, 2020, USA	Cross-sectional		83	79	DSM-IV	Cat bites	Psychosis and unipolar depression	OR	4
Bedwell, 2020, USA	Cross-sectional	109			PANSS	Cat bites	PANSS scores	aOR	4
Bedwell, 2020, USA	Cross-sectional	109			SPQ-BR total	Cat bites	Schizotypy	aOR	4
Bedwell, 2020, USA	Cross-sectional	109			SPQ-BR Cognitive-perceptual	Cat bites	PLE	aOR	4
Lindgren, 2017, Finland	Cross-sectional	5906			DSM-VI/SCID-1	Cat ownership	PLE	aOR	7
Kolpakova, 2013, USA	Cross-sectional	354			SPQ-BR	Cat bites	Schizotypy	OR	3
Palomäki, 2019, Finland	Retrospective cohort	5713			PAS	Cat ownership	PLE	Mean	8
Palomäki, 2019, Finland	Retrospective cohort	5713			SAS	Cat ownership	PLE	Mean	8

Palomäki, 2019, Finland	Retrospective cohort	5713			PER	Cat ownership	PLE	Mean	8
Palomäki, 2019, Finland	Retrospective cohort	5713			SCHD	Cat ownership	PLE	Mean	8
Paquin, 2022, Canada	Retrospective cohort	1986			CAPE-P15	Cat ownership	PLE	adjBeta	7
Solmi, 2017, UK	Prospective cohort	4676/6705			PLIKSi/DISC-IV/SCAN	Cat ownership	PLE	OR	8
Solmi, 2017, UK	Prospective cohort	4676/6705			PLIKSi/DISC-IV/SCAN	Cat ownership	PLE	aOR	8
Torrey, 1995, USA	Case-control	792	264	528	Not specified	Cat ownership	Schizophrenia	OR	0

NS = Not specified; PLE = psychotic-like experiences, PAS= Physical Anhedonia Scale; SAS = Social Anhedonia Scale; PER= Perceptual Aberration Scale; SCHD= Schizoidia Scale; PANSS = Positive and Negative Syndrome Scale; OR = Odds ratio; aOR = Adjusted Odds ratio

*Quality score is out of total score of nine

Section and Topic	Item #	Checklist item	Location where item is reported, pages
TITLE			
Title	1	Identify the report as a systematic review.	1
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	3
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	3
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	3,4
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	3
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	3,4
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	4
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	4
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	5
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	5
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	5
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	5
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	5
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	5
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	5
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	5

Section and Topic	Item #	Checklist item	Location where item is reported, pages
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	5
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	5
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	5
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	5
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	5
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	6, Fig 1
Study characteristics	17	Cite each included study and present its characteristics.	eTable 3
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	5eTable 2,
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	8, Fig 2-3
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	eTable 2
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	7
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	Fig 2-3
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	na
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	10
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Figs 2-3
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	10-11
	23b	Discuss any limitations of the evidence included in the review.	10-11
	23c	Discuss any limitations of the review processes used.	10-11
	23d	Discuss implications of the results for practice, policy, and future research.	10-11
OTHER INFORMATION			

Section and Topic	Item #	Checklist item	Location where item is reported, pages
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	2, PROSPERO 2023
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	CRD42023426974
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	4-5
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	11
Competing interests	26	Declare any competing interests of review authors.	11
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	5

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

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