

Are family warmth and positive remarks related to outcomes in psychosis? A systematic review

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Review Article

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Abstract

Background. Affective attitudes and behaviours manifested within the family environment have been characterised as expressed emotion (EE). High EE environments have been robustly shown to put psychosis patients at a greater risk of relapse compared with low EE exposure. Positive EE dimensions (warmth; positive remarks) have received far less attention than negative EE dimensions such that EE has become synonymous with a negative family atmosphere; the predictive value of positive EE dimensions is largely ignored. A systematic review examining the relationship between positive family EE and outcomes in psychosis is needed. **Methods.** A systematic search was conducted. Studies reporting bias and study quality were assessed.

Results. A total of 2368 studies were identified. Of these, 27 met eligibility criteria reporting outcomes including relapse, symptomatology, social functioning and life satisfaction. Relapse was the most commonly measured outcome. Stronger evidence emerged for the association between EE warmth and outcomes compared with EE positive remarks, with effects mostly evident in the early phase of psychosis. Evidence for protective effects of warmth on relapse was found up to 9 months follow-up. No effects were evident between positive remarks and relapse. Studies assessing symptom outcomes showed inconsistent findings. Evidence for an association with social functioning was evident, primarily in at risk mental states. Warmth and positive remarks predicted life satisfaction.

Conclusions. The positive aspects of EE require further investigation with longitudinal research designs. Clinical interventions should focus not only on reducing negative aspects of EE but also foster warmth within families in the context of psychosis.

Family environment is a key influence on the course of psychosis (Cechnicki *et al.*, 2013). For many, family members are directly involved in the provision of care. A study of informal caregivers found that approximately 44% reported spending over 32 h per week with their family member with psychosis (Roick *et al.*, 2006). Family interventions (FIs) have been shown to reduce the likelihood of relapse for individuals across the spectrum of psychosis (Pharoah *et al.*, 2010) and are recommended in practice guidelines for psychosis internationally (NICE Clinical Guideline, 2014; Galletly *et al.*, 2016).

The affective attitudes and behaviours manifested within the family environment have been characterised as expressed emotion (EE; Leff and Vaughn, 1984). Various tools have been developed to measure EE, the gold-standard being the Camberwell Family Interview (CFI; Leff and Vaughn, 1984), which measures five dimensions: criticism, hostility, emotional over-involvement (EOI), warmth and positive remarks. Whilst the CFI provides a framework within which both negative and positive aspects of the environment can be captured, in practice the negative aspects have received far greater attention than the positive such that EE has become synonymous with a negative family atmosphere (Leff, 1989). This focus likely reflects the fact that in early CFI studies, warmth showed a curvilinear relationship with relapse for individuals diagnosed with schizophrenia, such that medium levels of family warmth predicted the lowest relapse rates (due to a tendency for high EOI to co-occur with high warmth). The predictive value of positive remarks, meanwhile, was not reported (Brown *et al.*, 1972). Subsequently, the warmth and positive remarks sub-scales were excluded from calculation of the EE index, the metric most commonly derived from the CFI and used to predict outcomes. The dichotomous EE index has been used to characterise families (or individuals) as ‘high EE’ or ‘low EE’, with high EE reflecting higher levels of criticism or EOI or the presence of hostility.

A robust finding within the literature is that individuals exposed to high EE environments are at a greater risk of relapse than those in low EE environments (Butzlaff and Hooley, 1998). Consequently, reducing high EE has become a key aim of many FIs in psychosis (Pharoah *et al.*, 2010). Whilst there is strong evidence for the predictive utility of the EE index in psychosis, characterising the affective environment of families using a dichotomous measure, derived solely based on negative factors, has clear limitations. The relative emphasis on

caregivers as potential risk factors rather than protective factors has been argued to potentially undervalue and disempower families (López *et al.*, 2004; Lee *et al.*, 2014) and to neglect potential mechanisms of change in FIs (Claxton *et al.*, 2017).

A growing number of studies have measured the relationship between positive EE dimensions and outcomes including more traditional relapse rates, but also domains such as social functioning and life satisfaction. An evaluation of the potential predictive value of these more positive aspects of the family environment is, therefore, timely. Given the accumulation of research relating to positive dimensions of EE, and the need to provide a balanced view of the role of EE in the context of psychosis, we sought to systematically identify, synthesise and evaluate evidence regarding their role in psychosis. Specifically, the question the review aims to answer is: are positive family factors, as reflected in warmth and positive remarks measured on the CFI, related to outcomes in psychosis?

Method

Search strategy

This study was conducted in accordance with PRISMA guidelines (Liberati *et al.*, 2009). Relevant papers were identified by conducting a systematic search of the electronic databases EMBASE, MEDLINE, PsycINFO, PubMed and Web of Science from inception to April 2017. Medical Subject Headings was used to maximise search results. Search terms were selected to capture papers relating to psychosis (psychosis; psychoses; psychotic; schizophreni*; 'severe mental'; 'serious mental'; 'serious psychiatric'; 'paranoi*'; 'delusion*'; 'hallucination*'; 'thought disorder') and warmth or positive remarks (warm*; 'expressed emotion'; 'positive remarks'). Within each search set, terms were linked using the Boolean operator 'OR' and the two sets of terms were linked using 'AND'. Terms were used to search titles and abstracts (and topics in Web of Science). Results were limited to English language. Reference lists of relevant retrieved articles were searched for additional studies.

Eligibility criteria

Study inclusion criteria were: (i) participants with psychosis or those at high risk for psychosis based on a validated measure of prodromal symptoms; (ii) measurement of warmth and/or positive remarks of a relative or other informal caregiver on the CFI; (iii) measurement of a relevant outcome for the individual with (or at risk of) psychosis (including relapse, symptom severity, hospital admission, social functioning and quality of life-related outcomes); (iv) a test of the relationship between warmth or positive remarks and the outcome measure and (v) an adult or adolescent sample. Exclusion criteria were: (i) grey literature; (ii) qualitative studies, (iii) single-case studies; (iv) psychosis secondary to organic pathology; (v) heterogeneous samples and (ix) positive EE measured in caregivers/staff. Two studies were excluded based on all relevant data being reported within other included studies.

Camberwell family interview

For inclusion, studies needed to use the CFI to measure warmth or positive remarks. Alternative measures of family environment [e.g. Family Environment Scale (Moos and Moos, 1994); Family

Assessment Device (Epstein *et al.*, 1983); Parental Bonding Instrument (Parker *et al.*, 1979)] were considered. However, we decided to exclude these because combining findings from studies using alternative predictor measures would have increased the heterogeneity of included studies, obfuscating interpretation of results. We also excluded self-report measures of warmth as perceived EE and CFI-rated EE have been found to measure slightly different constructs and are more subjective than the third-party rated CFI. For example, studies included in the current review that measured perceived and CFI-rated warmth found only a moderate correlation between the two (Schlosser *et al.*, 2010; Lee *et al.*, 2014). Furthermore, self-report measures of parental warmth, such as the EMBU (Perris *et al.*, 1986), are often rated retrospectively, referring to parental warmth during the person's upbringing.

Warmth is measured on the CFI using a six-point global rating (0 = no warmth, 5 = high warmth) reflecting tone of voice, spontaneity, sympathy, concern or empathy and interest in the person. Positive remarks are measured as a frequency count, based on the number of positive remarks made during the interview. Positive remarks are primarily defined by content that expresses praise, appreciation or approval, but tone of voice is also taken into account in its scoring.

Study selection and data extraction

The article selection process is illustrated in Fig. 1. The search produced 4689 results. Duplicate results were removed using Endnote reference manager before titles and abstracts were screened for inclusion. Full text articles were obtained for all potentially eligible studies, which were then reviewed according to eligibility criteria. RB assessed study eligibility with queries resolved through discussion with the research team. An independent rater assessed reliability of the selection process by reviewing 10% of titles and full-text articles. Estimates of inter-rater reliability showed good agreement at screening ($\kappa = 0.73$, $p < 0.001$) and full-text stages ($\kappa = 0.70$, $p < 0.001$; Landis and Koch, 1977). Data were extracted from included studies using a standardised form capturing details of the study sample, design, measures, analyses, results and strengths and limitations. Where sufficient data were available, effect sizes were calculated (Table 1). Eligible studies were assessed for risk of bias and study quality to inform the critical evaluation of their findings using an adapted version of the Effective Public Health Practice Project tool (EPHPP; Thomas *et al.*, 2004). A proportion of included studies were second rated for quality, with 100% agreement reached across all domain ratings.

Data analysis

Extracted data were tabulated and synthesised into a narrative review. There was a degree of heterogeneity across outcome measures utilised, as well as the study designs, follow-up periods and sample populations (in terms of culture and stage of psychosis). Study heterogeneity, as well as variable study quality, could have rendered a meta-analysis of included studies misleading. A narrative review of results was, therefore, deemed most appropriate. However, individual study effect sizes were included to aid assessment of the magnitude of relationships found and aid cross-study comparisons. Study findings were reviewed primarily according to outcome measures used. Where inconsistencies were observed, factors such as study culture and stage of psychosis were considered alongside quality assessment to inform interpretation.

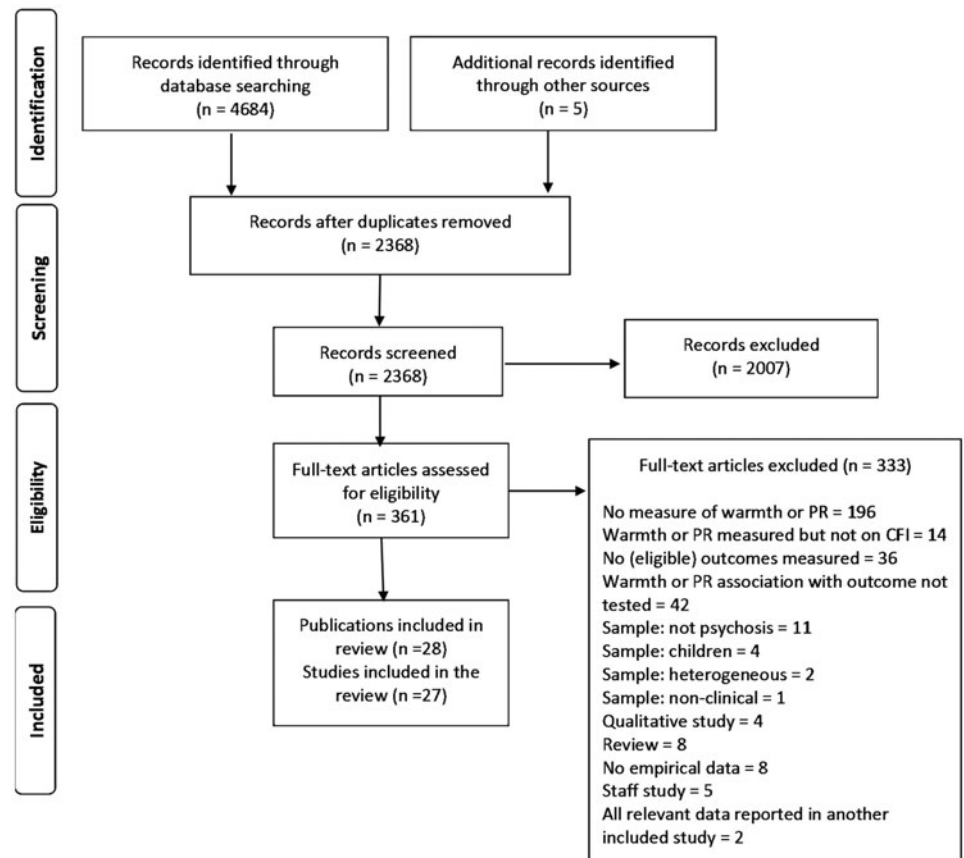


Fig. 1. Flowchart of study selection process.

Results

Overview of included studies

A summary of relevant findings of the 27 studies included is presented in Table 2.

All 27 studies tested the relationship between warmth and outcomes; 14 studies also measured positive remarks as a predictor. Most studies employed cohort designs ($n = 19$); the remaining were cross-sectional. Most studies were conducted in the USA ($n = 10$); four of these focused on Mexican-American participants. In a number of instances, data are reported for the same sample in more than one paper. However, these report findings using different outcome measures in all cases (relevant cases are noted in Table 2). Most participants had a schizophrenia-spectrum disorder diagnosis ($n = 23$). The most widely used measure of outcome was relapse rate ($n = 14$), defined according to symptom exacerbation and/or a change in clinical management (including hospital admission). Levels of symptoms, both psychotic and non-psychotic, were used in nine studies, and three studies measured prodromal symptoms. Other outcomes included social functioning ($n = 4$), life satisfaction ($n = 1$) and health ($n = 1$). Quality assessment scores are shown in online Supplementary Table S1. No study was deemed 'strong' across all domains assessed on the EPHPP. This was largely due to studies being cross-sectional in design and limitations in sample representativeness.

Relapse

Of the 15 studies that tested the relationship between relapse and warmth, five reported a statistically significant association (Brown

et al., 1972; Bertrando *et al.*, 1992; Ivanović *et al.*, 1994; Breitborde *et al.*, 2007; Lee *et al.*, 2014) and ten did not (Leff *et al.*, 1987, 1990;[†] McCreadie and Robinson, 1987; Parker *et al.*, 1988; Vaughan *et al.*, 1992; Ito and Oshima, 1995; King and Dixon, 1999; Lopez *et al.*, 1999; Yang *et al.*, 2004; Aguilera *et al.*, 2010). Where a relationship was found, lower rates of caregiver warmth was associated with higher participant relapse rates across cultures and phase of psychosis, even when controlling for potential confounds (Bertrando *et al.*, 1992; Lee *et al.*, 2014). One of the strongest quality rated papers included in the review found an association with relapse in first-episode psychosis (Lee *et al.*, 2014). Differences in stage of psychosis do not appear to explain the inconsistency of findings across other studies, which were all in samples with a schizophrenia-spectrum diagnosis. Studies that failed to find an association between warmth and relapse were largely comparable with those that did in terms of quality assessment profiles. Control for EE dimensions such as EOI was variable between studies reviewed, with no evidence of a systematic relationship between controlling for EE dimensions and positive or negative findings. Definition of relapse also failed to effect relationships with outcomes. Some studies argued that the relationship between warmth and relapse was best characterised as curvilinear; although, there was disagreement between these as to whether protective effects were most likely at moderate (Brown *et al.*, 1972) or high levels of warmth (Breitborde *et al.*, 2007).

All but one (McCreadie and Robinson, 1987) of the relapse studies employed prospective follow-up designs. At 9-month

[†]The notes appear after the main text.

Table 1. Study effect sizes

Predictor	Outcome	Paper	Type of analysis	Effect size (<i>d</i>)	Effect size interpretation
Warmth	Relapse	Bertrando <i>et al.</i> (1992)	Group difference	−0.66	Medium
Warmth	Relapse	Brown <i>et al.</i> (1972)	NA	NA	NA ^a
Warmth	Relapse	Ito and Oshima (1995)	Correlation	−0.45	Small
Warmth	Relapse	King and Dixon (1999)	Group difference: paternal	−0.09	Trivial
Warmth	Relapse	King and Dixon (1999)	Group difference: maternal	−0.4	Small
Warmth	Relapse	Lee <i>et al.</i> (2014)	Correlation: 6 mt	−0.82	Large
Warmth	Relapse	Lee <i>et al.</i> (2014)	Correlation: 12 mt	−0.61	Medium
Warmth	Relapse	Lee <i>et al.</i> (2014)	Regression: 6 mt (controlling for covariates)	−0.48	Small
Warmth	Relapse	Lee <i>et al.</i> (2014)	Regression: 12 mt (controlling for covariates)	−0.39	Small
Warmth	Relapse	Lopez <i>et al.</i> (1999)	Correlation	−0.22	Small
Warmth	Relapse	McCreadie and Robinson (1987)	NA	NA	NA ^a
Warmth	Relapse	Mueser <i>et al.</i> (1993)	NA	NA	NA ^a
Warmth	Relapse	Parker <i>et al.</i> (1988)	Group difference: maternal	−0.47	Small
Warmth	Relapse	Parker <i>et al.</i> (1988)	Group difference: paternal	−0.33	Small
Warmth	Relapse	Vaughan <i>et al.</i> (1992)	NA	NA	NA ^a
Warmth	Relapse	Yang <i>et al.</i> (2004)	Correlation	−0.16	Trivial
Warmth	Relapse	Breitborde <i>et al.</i> (2007)	NA	NA	NA ^a
Warmth	Relapse	Ivanović <i>et al.</i> (1994)	Group difference: maternal	−0.89	Large
Warmth	Relapse	Ivanović <i>et al.</i> (1994)	Group difference: paternal	−0.88	Large
Warmth	Relapse	Leff <i>et al.</i> (1987, 1990)	Group difference: 12 mt	−0.23	Small
Warmth	Relapse	Leff <i>et al.</i> (1987, 1990)	Group difference: 24 mt	−0.35	Small
Warmth	Composite symptoms	Barrowclough <i>et al.</i> (2003)	Correlation	−0.3	Small
Warmth	Composite symptoms	Leff <i>et al.</i> (2001)	Correlation of change in RCT	−1.58	Large
Warmth	Composite symptoms	Lopez <i>et al.</i> (1999)	Correlation	−0.18	Trivial
Warmth	Composite symptoms	Medina-Pradas <i>et al.</i> (2013)	Correlation	−1.91	Large
Warmth	Positive symptoms	Barrowclough <i>et al.</i> (2003)	Correlation	−0.24	Small
Warmth	Positive symptoms	Kuipers <i>et al.</i> (2006)	Correlation	−0.12	Trivial
Warmth	Positive symptoms	Lopez <i>et al.</i> (1999)	Correlation	−0.39	Small
Warmth	Positive symptoms	Medina-Pradas <i>et al.</i> (2013)	Correlation	−1.04	Large
Warmth	Positive symptoms	Mueser <i>et al.</i> (1993)	NA	NA	NA ^a
Warmth	Positive symptoms	Ramirez and Andreu (2006)	Correlation	−0.26	Small
Warmth	Positive symptoms	Aguilera <i>et al.</i> (2010)	Regression: 12 mt (controlling for medication adherence)	−0.02	Trivial
Warmth	Negative symptoms	Barrowclough <i>et al.</i> (2003)	Correlation	−0.63	Medium
Warmth	Negative symptoms	Kuipers <i>et al.</i> (2006)	Correlation	0.41	Small
Warmth	Negative symptoms	Lopez <i>et al.</i> (1999)	Correlation	−0.37	Small
Warmth	Negative symptoms		Correlation	−1.25	Large

(Continued)

Table 1. (Continued.)

Predictor	Outcome	Paper	Type of analysis	Effect size (<i>d</i>)	Effect size interpretation
		Medina-Pradas <i>et al.</i> (2013)			
Warmth	Negative symptoms	Mueser <i>et al.</i> (1993)	NA	NA	NA ^a
Warmth	Depression	Barrowclough <i>et al.</i> (2003)	Correlation	−0.37	Small
Warmth	Depression	Kuipers <i>et al.</i> (2006)	Correlation	−0.26	Small
Warmth	Depression	Tarrier <i>et al.</i> (2004)	Correlation	−0.58	Medium
Warmth	Anxiety	Kuipers <i>et al.</i> (2006)	Correlation	0.14	Trivial
Warmth	General psychopathology	Kuipers <i>et al.</i> (2006)	Correlation	0.26	Small
Warmth	General psychopathology	Medina-Pradas <i>et al.</i> (2013)	Correlation	−1.42	Large
Warmth	Prodromal: positive	O'Brien <i>et al.</i> (2006)	Correlation with symptom reduction	0.30	Small
Warmth	Prodromal: positive	O'Brien <i>et al.</i> (2008)	Correlation with f-u symptom level	−0.14	Trivial
Warmth	Prodromal: positive	Schlosser <i>et al.</i> (2010)	NA	NA	NA ^a
Warmth	Prodromal: negative	O'Brien <i>et al.</i> (2006)	Correlation with symptom reduction	0.72	Medium
Warmth	Prodromal: negative	O'Brien <i>et al.</i> (2008)	Correlation with f-u symptom level	−0.02	Trivial
Warmth	Prodromal: general	O'Brien <i>et al.</i> (2006)	Correlation with symptom reduction	0.65	Medium
Warmth	Prodromal: general	O'Brien <i>et al.</i> (2008)	Correlation with f-u symptom level	−0.18	Trivial
Warmth	Prodromal: disorganised	O'Brien <i>et al.</i> (2006)	Correlation with symptom reduction	0.56	Medium
Warmth	Prodromal: disorganised	O'Brien <i>et al.</i> (2008)	Correlation with f-u symptom level	−0.12	Trivial
Warmth	Suicidality: desire	Tarrier <i>et al.</i> (2004)	Group difference	−0.35	Small
Warmth	Suicidality: attempts	Tarrier <i>et al.</i> (2004)	Group difference	−0.40	Small
Warmth	Suicidality: BSI	Tarrier <i>et al.</i> (2004)	Correlation	−0.32	Small
Warmth	Hopelessness	Tarrier <i>et al.</i> (2004)	Correlation	−0.43	Small
Warmth	Self-esteem	Kuipers <i>et al.</i> (2006)	Correlation	−0.12	Trivial
Warmth	Self-esteem	Barrowclough <i>et al.</i> (2003)	Correlation with multiple subscales	0.02 to 0.75	Trivial to medium
Warmth	Social functioning	O'Brien <i>et al.</i> (2006)	Correlation with improvement	0.95	Large
Warmth	Social functioning	O'Brien <i>et al.</i> (2008)	Correlation with functioning at f-u	0.93	Large
Warmth	Social functioning	King and Dixon (1999)	Regression of multiple subscales: 9 mt (controlling for covariates)	−0.63 to −1.24	Medium to large ^b
Warmth	Social functioning	Schlosser <i>et al.</i> (2010)	Regression of functioning change	0.77	Medium
Warmth	Life satisfaction	Greenberg <i>et al.</i> (2006)	Correlation	0.54	Medium
Warmth	Health: physical, mental, general	Breitborde <i>et al.</i> (2007)	NA	NA	NA ^a
PR	Relapse	Ito and Oshima (1995)	Correlation	−0.30	Small
PR	Relapse	King and Dixon (1999)	Group difference: paternal	0.00	Trivial
PR	Relapse	King and Dixon (1999)	Group difference: maternal	−0.33	Small
PR	Relapse	Lee <i>et al.</i> (2014)	Correlation: 6 mt	−0.37	Small
PR	Relapse	Lee <i>et al.</i> (2014)	Correlation: 12 mt	−0.20	Small
PR	Relapse	Parker <i>et al.</i> (1988)	Group difference: maternal	−0.05	Trivial
PR	Relapse	Parker <i>et al.</i> (1988)	Group difference: paternal	−0.06	Trivial
PR	Composite symptoms		Correlation	−0.14	Trivial

(Continued)

Table 1. (Continued.)

Predictor	Outcome	Paper	Type of analysis	Effect size (<i>d</i>)	Effect size interpretation
		Barrowclough <i>et al.</i> (2003)			
PR	Composite symptoms	Medina-Pradas <i>et al.</i> (2013)	Correlation	−0.54	Medium
PR	Positive symptoms	Barrowclough <i>et al.</i> (2003)	Correlation	−0.16	Trivial
PR	Positive symptoms	Kuipers <i>et al.</i> (2006)	Correlation	0.20	Small
PR	Positive symptoms	Medina-Pradas <i>et al.</i> (2013)	Correlation	−0.49	Small
PR	Negative symptoms	Barrowclough <i>et al.</i> (2003)	Correlation	−0.22	Small
PR	Negative symptoms	Kuipers <i>et al.</i> (2006)	Correlation	0.24	Small
PR	Negative symptoms	Medina-Pradas <i>et al.</i> (2013)	Correlation	−0.14	Trivial
PR	Depression	Barrowclough <i>et al.</i> (2003)	Correlation	−0.37	Small
PR	Depression	Kuipers <i>et al.</i> (2006)	Correlation	−0.16	Trivial
PR	Depression	Tarrier <i>et al.</i> (2004)	Correlation	−0.12	Trivial
PR	Anxiety	Kuipers <i>et al.</i> (2006)	Correlation	0.24	Small
PR	General psychopathology	Kuipers <i>et al.</i> (2006)	Correlation	0.47	Small
PR	General psychopathology	Medina-Pradas <i>et al.</i> (2013)	Correlation	−0.18	Trivial
PR	Prodromal: positive	O'Brien <i>et al.</i> (2006)	Correlation with symptom reduction	0.26	Small
PR	Prodromal: positive	O'Brien <i>et al.</i> (2008)	Correlation with f-u symptom level	−0.12	Trivial
PR	Prodromal: negative	O'Brien <i>et al.</i> (2006)	Correlation with symptom reduction	1.09	Large
PR	Prodromal: negative	O'Brien <i>et al.</i> (2008)	Correlation with f-u symptom level	−0.9	Large
PR	Prodromal: general	O'Brien <i>et al.</i> (2006)	Correlation with symptom reduction	0.49	Small
PR	Prodromal: general	O'Brien <i>et al.</i> (2008)	Correlation with f-u symptom level	−0.59	Medium
PR	Prodromal: disorganised	O'Brien <i>et al.</i> (2006)	Correlation with symptom reduction	1.09	Large
PR	Prodromal: disorganised	O'Brien <i>et al.</i> (2008)	Correlation with f-u symptom level	−0.41	Small
PR	Suicidality: desire	Tarrier <i>et al.</i> (2004)	Group difference	−0.40	Small
PR	Suicidality: attempts	Tarrier <i>et al.</i> (2004)	Group difference	0.11	Trivial
PR	Suicidality: BSI	Tarrier <i>et al.</i> (2004)	Correlation	−0.12	Trivial
PR	Hopelessness	Tarrier <i>et al.</i> (2004)	Correlation	−0.04	Trivial
PR	Self-esteem	Kuipers <i>et al.</i> (2006)	Correlation	−0.02	Trivial
PR	Self-esteem	Barrowclough <i>et al.</i> (2003)	Correlation with multiple subscales	0.00 to −0.30	None to small
PR	Social functioning	O'Brien <i>et al.</i> (2006)	Correlation with improvement	−0.2	Small
PR	Social functioning	O'Brien <i>et al.</i> (2008)	Correlation with functioning at f-u	0.2	Small
PR	Social functioning	King and Dixon (1999)	Regression of multiple subscales: 9 mt (controlling for covariates)	0.46 to 1.35	Small to large ^b
PR	Life satisfaction	Greenberg <i>et al.</i> (2006)	Correlation	0.43	Small

PR, positive remarks; f-u, follow-up; mt, months; RCT, randomised controlled trial.

^aNot possible to calculate effect size *d* from data reported.

^bRange of significant effects as data only provided for significant results.

Table 2. Summary of main review findings

Paper	Sample ^a	Design	Predictor measure	Outcome measures	Main findings
Aguilera <i>et al.</i> (2010)	60 participants with diagnoses of schizophrenia or schizoaffective disorder (relapse analyses $n = 55$). USA, Mexican-American sample.	12-month prospective follow-up	Warmth	(a) Relapse: based on hospital admission and/or symptom exacerbation (b) Symptom trajectory: monthly measurement on expanded BPRS – focused on positive symptoms	Warmth did not predict relapse ($r = 0.07$). Warmth did not predict symptom trajectory in a model including adjustment for medication adherence (coefficient -0.01 , s.e. 0.11 , T ratio -0.13 , $df = 55$, $p = 0.09$). ^b
Barrowclough <i>et al.</i> (2003) ^c	59 participants with diagnoses of schizophrenia (83%), schizophreniform disorder (12%), or schizoaffective disorder (5%). UK.	Cross-sectional	Warmth and positive remarks	Symptoms: PANSS negative, PANSS positive, PANSS total, PANSS depression, PANSS delusions, PANSS hallucinations Self-esteem: SESS-sv	Warmth significantly negatively correlated with negative symptoms ($r = -0.30$, $p < 0.02$) but did not correlate significantly with positive symptoms ($r = -0.12$), PANSS total ($r = -0.15$), depression ($r = -0.18$), delusions ($r = -0.06$) or hallucinations ($r = -0.02$). Warmth significantly positively correlated with positive evaluation of role performance ($r = 0.35$, $p < 0.01$) but not positive evaluation of personal attributes ($r = 0.03$), total PES ($r = 0.20$), negative evaluation of role performance ($r = -0.18$), negative evaluation of personal attributes ($r = -0.05$), self-acceptance ($r = 0.01$) or total NES ($r = -0.09$). Positive remarks did not correlate with symptoms: PANSS total ($r = -0.07$), positive ($r = -0.08$), negative ($r = -0.11$), depression ($r = -0.18$), hallucinations ($r = 0.01$), delusions ($r = -0.006$). Positive remarks did not correlate with self-esteem: positive evaluation of role performance ($r = -0.03$), positive evaluation of personal attributes ($r = -0.15$), total PES ($r = -0.13$), negative evaluation of role performance ($r = 0.00$), negative evaluation of personal attributes ($r = 0.06$), self-acceptance ($r = 0.05$) or total NES ($r = 0.04$).
Bertrando <i>et al.</i> (1992)	42 participants with diagnoses of schizophrenia (93%) or schizophreniform disorder (7%). Italy, Milan.	9-month prospective follow-up	Warmth	Relapse: based on hospital admission	There were significantly fewer hospital admissions of participants in high warmth than low warmth households during follow-up ($\chi^2 = 4.15$, $p < 0.05$). Sub-group analyses found this was the case in low and high EE families.
Breitborde <i>et al.</i> (2007) ^d	44 participants with a diagnosis of schizophrenia (43 included in warmth analyses). USA, Mexican-American sample.	Analysis of 9-month follow-up data	Warmth	Relapse: based on symptom exacerbation	There was a statistically significant linear relationship between warmth and relapse ($\beta = -0.77$; 95% confidence interval; β : -1.41 to -0.22 ; exact $p < 0.01$). However, the authors demonstrated that the relationship was best described by a curvilinear model in which the risk of relapse decreased at an increasing rate as warmth increased.
Breitborde <i>et al.</i> (2007)	60 participants with diagnoses of schizophrenia (75%) or schizoaffective disorder (25%). USA, Mexican-American sample.	13-month prospective follow-up	Warmth	Health: physical, mental and general health composite scores on the RAND-36	Warmth did not significantly predict participants' scores on any outcome measures: physical health composite ($B = 0.06$), mental health composite ($B = 0.90$), general health composite ($B = 0.24$).

Brown <i>et al.</i> (1972)	101 participants with a diagnosis of schizophrenia. UK.	9-month prospective follow-up	Warmth	Relapse: based on symptom exacerbation	Warmth showed a curvilinear association with relapse – individuals from medium warmth households had the lowest relapse rates. Low warmth relatives tended to score high on criticism. High warmth relatives tended to score high on EOI. Warmth in the absence of criticism and EOI was associated with low relapse rates. 1/11 participants from a high warmth/low EE family relapsed ($p < 0.01$)
Greenberg <i>et al.</i> (2006)	122 participants with schizophrenia or schizoaffective disorder. USA (<10% of sample from ethnic minority groups)	Cross-sectional analysis of data from a longitudinal study	Warmth and positive remarks	Life satisfaction: measured on the Self and Present Life sub-scale of the Satisfaction With Life Scale	Warmth correlated significantly with life satisfaction ($r = 0.26$, $p < 0.01$). Positive remarks correlated significantly with life satisfaction ($r = 0.21$, $p < 0.05$). Warmth and positive remarks remained significant predictors of life satisfaction in hierarchical regression models including gender, age, depressive symptoms, level of functioning and number of close friends.
Ito and Oshima (1995)	88 participants with diagnoses of schizophrenia, schizophreniform disorder or delusional disorder. Japan, Tokyo area.	9-month prospective follow-up	Warmth and positive remarks	Relapse: based on symptom exacerbation 'in need of therapeutic qualitative change'	Warmth did not significantly predict relapse ($r = -0.22$). Positive remarks did not significantly predict relapse ($r = -0.15$).
Ivanović <i>et al.</i> (1994)	60 participants (57 included in analysis) with diagnoses of hebephrenic (50%) or paranoid (50%) schizophrenia. Belgrade, Serbia.	9-month prospective follow-up	Warmth	Relapse: based on symptom exacerbation	There was an inverse relationship between maternal or paternal warmth and relapse. Relapse rates when maternal warmth was: high = 25%, medium = 25%, low = 68.8% ($\chi^2 = 9.33$, $p = 0.0094$). Relapse rates when paternal warmth was: high = 19%, medium = 50%, low = 57.1% ($\chi^2 = 5.91$, $p = 0.052$).
King and Dixon (1999) ^e	69 participants with a diagnosis of schizophrenia (relapse data for 66). Montreal, Canada.	9-month prospective follow-up	Warmth and positive remarks	Social adjustment: measured on the SAS-II. Assessed functioning in several roles: work, household member, external family member and social-leisureite, plus a global score reflecting general social adjustment	Employed hierarchical regression models including block one: total symptoms, block two: FACES-II scores, block three: CFI sub-scales. Average household warmth predicted household member functioning ($\beta = -0.302$, $p < 0.05$) but did not predict general, work, external family or social-leisureite functioning. Maternal warmth did not significantly predict any scores. Paternal warmth predicted general ($\beta = -0.387$, $p < 0.05$) and household member ($\beta = -0.528$, $p < 0.01$) functioning only. Average household positive remarks predicted household member ($\beta = 0.382$, $p < 0.01$) and external family ($\beta = 0.225$, $p < 0.05$) functioning only. Maternal positive remarks did not predict any scores. Paternal positive remarks predicted general ($\beta = 0.550$, $p < 0.01$), household member ($\beta = 0.560$, $p < 0.01$), and external family ($\beta = 0.346$, $p < 0.05$) functioning.
King and Dixon (1999) ^e	69 participants with a diagnosis of schizophrenia. Montreal, Canada.	9-month prospective follow-up	Warmth and positive remarks	Relapse: based on important changes in clinical management (e.g. admission to a psychiatric facility, emergency clinic visit resulting in retention for observation or substantial increase in antipsychotic medication)	Paternal and maternal warmth did not significantly predict relapse (mean paternal warmth = 2.8 relapsed v. 2.7 not relapsed. Mean maternal warmth = 3.1 relapsed v. 2.7 not relapsed). Maternal and paternal positive remarks did not significantly predict relapse. (Mean paternal positive remarks = 3.6 relapsed v. 3.6 not relapsed. Mean maternal positive remarks = 4.4 relapsed v. 3.4 not relapsed).
Kuipers <i>et al.</i> (2006)	86 participants with diagnoses of schizophrenia, schizoaffective disorder or delusional disorder (excluded)	Cross-sectional	Warmth and positive remarks	Symptoms: PANSS positive, PANSS negative, PANSS general, BDI, BAI. Self-esteem: RSES.	Warmth did not predict symptoms (PANSS positive $r = -0.06$, PANSS negative $r = 0.20$, PANSS general $r = 0.13$, BDI $r = -0.13$, BAI $r = 0.07$, SES $r = -0.06$). Warmth also did not contribute to ability of regression models including all EE sub-scales to

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Table 2. (Continued.)

Paper	Sample ^a	Design	Predictor measure	Outcome measures	Main findings
	FEP). UK, London and East Anglia.				predict BDI or BAI scores (criticism was the only EE measure to predict BAI and none predicted BDI). Positive remarks predicted PANSS general scores ($r = 0.23$, $p < 0.05$) but no other symptoms measures (PANSS positive $r = 0.10$, PANSS negative $r = 0.12$, BDI $r = -0.08$, BAI $r = 0.12$, SES $r = -0.01$). Positive remarks also did not contribute to ability of regression models including all EE sub-scales to predict BDI or BAI scores.
Lee et al. (2014)	65 participants with first-episode psychosis. UK, North West.	6- and 12-month prospective follow-up	Warmth and positive remarks	Relapse: based on symptom exacerbation, accompanied by a change in management (e.g. an increase in antipsychotic medication)	Warmth correlated with relapse at 6 months ($r = -0.38$, $p < 0.05$) and 12 months ($r = -0.29$, $p < 0.05$). In a logistic regression including PANSS total scores, substance use, employment status and contact hours warmth was a significant predictor whilst controlling for covariates at 6 months (OR 0.42, $p < 0.05$) but not at 12 months. Positive remarks were not significantly correlated with relapse at 6 ($r = -0.18$) or 12 months ($r = -0.10$).
Leff et al. (1987, 1990) ^f	78 participants with a diagnosis of schizophrenia (70 at 1 year, 60 at 2 years). Hindi-speaking sample in North India – urban and rural sub-samples.	1- and 2-year prospective follow-up	Warmth	Relapse: based on symptom exacerbation	Warmth did not significantly predict relapse at 1- or 2-year follow-up. At 1-year the relapse rate in high warmth families (relative rated 4+) was 7% compared with 16% in low warmth families (relative rated <4). This difference was not statistically significant. At 2-year the relapse rate in high warmth families was 21% compared with 41% in low warmth families. This difference was not statistically significant.
Leff et al. (2001)	30 participants at baseline (16 in experimental group) with a diagnosis of schizophrenia. UK, London.	Correlation of changes in warmth and symptoms during 12-month RCT	Warmth	Symptoms: PSE (and in a small number of cases Syndrome Checklist to evaluate case notes)	Family warmth and participant's symptoms were measured before and after an intervention in high EE families. Increases in relatives' warmth correlated with decreases in participants' symptoms post-intervention ($r = 0.62$, $p = 0.004$).
Lopez et al. (1999) ^g	54 participants with a diagnosis of schizophrenia (31 included in analysis, except negative symptoms $n = 30$). USA, Anglo-American sample.	Analysis of 9-month follow-up data	Warmth	(a) Relapse: based on symptom exacerbation and monthly reports from relatives (b) Symptoms: PSE, PAS (positive and negative symptoms)	In families that were not high on EOI, warmth did not predict relapse ($r = -0.11$), PSE symptoms ($r = -0.09$), positive symptoms ($r = -0.19$), or negative symptoms ($r = -0.18$) ^b .
McCreadie and Robinson (1987)	60 participants with a diagnosis of schizophrenia. UK, rural Scotland.	12-month retrospective case-note review	Warmth and positive remarks	Hospital re-admissions	No significant differences in warmth of relatives of participants who were admitted during 12-month period v. those not admitted. No significant difference in the positive remarks of relatives of participants who were admitted v. not admitted. (No statistics given)
Medina-Pradas et al. (2013)	21 participants with a diagnosis of schizophrenia. Spain, Barcelona.	Cross-sectional	Warmth and positive remarks	Symptoms: psychotic symptoms on PANSS positive, negative, general Psychopathology, and total sub-scales	Warmth was negatively correlated with all symptom dimensions (PANSS positive $r = -0.46$, $p = 0.04$; PANSS negative $r = -0.53$, $p = 0.01$; PANSS general psychopathology $r = -0.58$, $p = 0.01$; PANSS total $r = -0.69$, $p = 0.001$). Positive remarks were not significantly correlated with any symptom dimensions (PANSS positive $r = -0.24$, $p = 0.29$; PANSS negative $r = -0.07$, $p = 0.78$; PANSS general psychopathology $r = -0.09$, $p = 0.69$; PANSS total $r = -0.26$, $p = .26$).

Mueser <i>et al.</i> (1993)	48 participants with diagnoses of schizophrenia (62.5%) or schizoaffective disorder (37.5%). USA, East Pennsylvania.	Cross-sectional	Warmth	Symptoms: positive symptoms on BPRS and negative symptoms on SANS	Warmth was not significantly related to symptoms on the BPRS or SANS. (No statistics given)
O'Brien <i>et al.</i> (2006) ^h	26 participants at imminent risk of psychosis according to SIPS. USA, California.	3-month prospective follow-up	Warmth and positive remarks	(a) Prodromal symptoms: SOPS (positive psychotic, negative, general and disorganised symptoms sub-scales) (b) Social functioning: measured on a single item from the SCOS	Warmth predicted improvement in social functioning at follow-up ($r = 0.43, p < 0.05$). Warmth did not predict changes in prodromal symptoms (positive $r = 0.15$, negative $r = 0.34$, general $r = 0.31$, disorganised $r = 0.27$). Positive remarks did not predict changes in social functioning at follow-up ($r = -0.10$). Positive remarks predicted improvements in negative ($r = 0.48, p < 0.05$) and disorganised prodromal symptoms ($r = 0.48, p < 0.05$) at follow-up (but not positive or general symptoms, $r = 0.13$ and $r = 0.24$).
O'Brien <i>et al.</i> (2008)	40 participants (32 at follow-up) at 'ultra-high-risk' for psychosis according to SIPS. USA, California.	4-month prospective follow-up	Warmth and positive remarks	(a) Prodromal symptoms: SOPS (positive psychotic, negative, general and disorganised symptoms sub-scales) (b) Social functioning: SCOS (duration and frequency of hospital admissions, social contacts outside the family and employment or school)	Warmth predicted increased social functioning at follow-up ($r = 0.42, p < 0.05$) but did not predict non-hospitalisation ($r = 0.22$) or school/work ($r = -0.01$). Warmth did not predict positive ($r = -0.07$), negative ($r = -0.01$), disorganised ($r = -0.06$) or general ($r = -0.09$) prodromal symptoms at follow-up. Positive remarks did not predict functioning at follow-up (social $r = 0.10$, non-hospitalisation $r = 0.12$, school/work $r = 0.06$). Positive remarks predicted improvements in negative ($r = -0.41, p < 0.05$) but not positive ($r = -0.06$), disorganised ($r = -0.20$) or general ($r = -0.28$) prodromal symptoms at follow-up.
Parker <i>et al.</i> (1988)	57 participants with a diagnosis of schizophrenia. Australia, Sydney.	8-month prospective follow-up (from 1 to 9 months post-discharge)	Warmth and positive remarks	Relapse: based on symptom exacerbation or hospital admission	Maternal and paternal warmth did not significantly predict relapse (maternal warmth $t = 1.74$, paternal warmth $t = 1.24$). Maternal and paternal positive remarks did not significantly predict relapse. (Maternal positive remarks: $t = 0.20$, paternal positive remarks: $t = 0.23$).
Ramirez and Andreu (2006)	30 participants with a diagnosis of schizophrenia. USA, California. Sample of Mexican descent.	Cross-sectional analysis of baseline data from follow-up study	Warmth	Symptoms: positive symptoms on PAS	Baseline warmth and positive symptoms were not correlated ($r = -0.13$).
Schlosser <i>et al.</i> (2010) ^h	63 participants (CFI data for 61, follow-up data for 59) that met criteria for a 'prodromal syndrome' on the SIPS. USA, California.	6-month prospective follow-up	Warmth	(a) Positive prodromal symptoms: SOPS positive sub-scale (b) Social/occupational functioning: SCOS aggregate score	Hostility and criticism predicted follow-up positive prodromal symptoms, warmth did not significantly add to the predictive model. Warmth and EOI interacted to predict social functioning improvements ($\beta = 3.90; t = 2.90; p = 0.006$). Higher levels of warmth predicted improved changes in functioning when EOI was moderate.
Tarrier <i>et al.</i> (2004) ^c	59 participants with a diagnosis of schizophrenia (83%), schizophreniform disorder (12%) or schizoaffective disorder (5%). All diagnosed within last 3 years. UK.	Cross-sectional	Warmth and positive remarks	(a) Suicidality: BSI, BHS (b) Symptoms: depression on BDI	Warmth did not significantly discriminate participants with a desire for suicide and those with no desire for suicide ($t = 1.4, p = 0.17$). Warmth did not predict whether participants had previously attempted suicide or not ($t = 1.9, p = 0.07$). Warmth correlated with depression (BDI $r = -0.28, p = 0.04$) but not hopelessness (BHS $r = -0.21$) or BSI score ($r = -0.16$). Fewer positive remarks from relatives were associated with a desire for suicide ($t = 2.1, p = 0.05$). Positive remarks did not predict previous suicide attempts ($t = 0.2, p = 0.84$). Positive remarks were not correlated with depression, (BDI $r = -0.06$), hopelessness (BHS $r = -0.02$), or total BSI score ($r = -0.06$).

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Table 2. (Continued.)

Paper	Sample ^a	Design	Predictor measure	Outcome measures	Main findings
Vaughan et al. (1992)	91 participants with a diagnosis of schizophrenia. Australia, Sydney.	9-month prospective follow-up	Warmth and positive remarks	Relapse: based on symptom exacerbation or suicide	Warmth did not significantly predict relapse at 9 months (in a model including demographic and other EE variables). Positive remarks did not significantly predict relapse at 9 months (in a model including demographic and other EE variables). (No statistics given)
Yang et al. (2004)	54 participants with a diagnosis of schizophrenia (relapse data for 52). China, Jingzhou and Beijing.	18-month prospective follow-up	Warmth	Relapse: based on symptom exacerbation or hospital admission	Warmth did not predict relapse at 18-month follow-up ($r = -0.08$)

BAI, Beck Anxiety Inventory (Beck et al., 1988); BDI, Beck Depression Inventory (Beck et al., 1961); BPRS, Brief Psychiatric Rating Scale (Overall and Gorham, 1962); BHS, Beck Hopelessness Scale (Beck and Steer, 1978); BSI, Beck Suicidal Ideation Scale (Beck and Steer, 1991); NES, Negative Evaluation of Self; FACES II, Family Adaptability and Cohesion Evaluation Scale (Olson et al., 1985); PANSS, Positive and Negative Symptoms Scale (Kay et al., 1987); PAS, Psychiatric Assessment Scale (Krawiecki et al., 1977); PES, Positive Evaluation of Self; PSE, Present State Examination (Wing et al., 1974); RAND-36, RAND 36-Item Health Inventory (Hays et al., 1998); RSES, Rosenberg Self-Esteem Scale (Rosenberg, 1965); SANS, Scale for the Assessment of Negative Symptoms (Andreasen, 1982); SAS-II, Social Adjustment Scale; Satisfaction With Life Scale (Test et al., 2005); SCOS, Strauss-Carpenter Outcome Scales (Strauss and Carpenter, 1972); SESS-sv, Self-Evaluation and Social Support Interview (Humphreys et al., 2001); SIPS, Structured Interview for Prodromal Symptoms (Miller et al., 2002); SOPS, Scale of Prodromal Symptoms (Miller et al., 2002).

^aStudy samples included both the person with (or at risk of) psychosis and their caregiver(s). Numbers represent the number of people with (or at risk of) psychosis included in the sample.

^bSymptom scores contributed to evaluation of relapse.

^cBarrowclough et al. (2003) and Tarrler et al. (2004) report data from the same sample.

^dBreitborde et al. (2007) analysed data from Karno et al. (1987).

^eKing and Dixon (1999) report data from the same sample.

^fLeff et al. (1987) and (1990) report 1-year and 2-year data, respectively, from the same sample.

^gLopez et al. (1999) report data collected by Vaughn et al. (1984).

^h24/63 participants in Schlosser et al. (2010) also took part in O'Brien et al. (2006).

follow-up, four studies found an association (Brown et al., 1972; Bertrando et al., 1992; Ivanović et al., 1994; Breitborde et al., 2007) and four did not (Vaughan et al., 1992; Ito and Oshima, 1995; King and Dixon, 1999; Lopez et al., 1999). Studies with follow-up greater than 9 months failed to find an association (Leff et al., 1987, 1990; McCreadie and Robinson, 1987; Yang et al., 2004; Aguilera et al., 2010), apart from Lee et al. (2014) who found significant correlations between warmth and relapse at 6 (large effect size) and 12 months (medium effect size); although, the 12-month relationship was no longer significant when total symptoms on the Positive and Negative Syndrome Scale (PANSS), substance use, employment and contact time with relative were controlled for. Differences in study culture do not appear to explain discrepancies found. However, studies outside of the USA/Europe reported null findings (Leff et al., 1987, 1990; Parker et al., 1988; Vaughan et al., 1992; Ito and Oshima, 1995; King and Dixon, 1999; Yang et al., 2004).

Six studies tested the relationship between positive remarks and relapse, none of which found a significant association (McCreadie and Robinson, 1987; Parker et al., 1988; Vaughan et al., 1992; Ito and Oshima, 1995; King and Dixon, 1999; Lee et al., 2014).

Symptom severity

Composite symptom scores

Four studies examined associations between warmth and overall symptom scores (Lopez et al., 1999; Leff et al., 2001; Medina-Pradas et al., 2013). Two longitudinal studies examined whether warmth predicted changes in scores on the Present State Examination (Wing et al., 2012), with one finding a significant association [large effect size (Leff et al., 2001)] and the other finding no association [trivial effect size (Lopez et al., 1999)]. The contradictory findings may reflect differences in study design. Lopez et al. (1999) employed an observational longitudinal design, where baseline warmth was used to predict symptoms during a follow-up period. Leff et al. (2001) reported findings from a FI trial, with increases in relatives' warmth found to correlate significantly with reductions in individuals with psychosis' symptoms when pre- and post-intervention scores were compared. Two cross-sectional studies examined whether warmth related to PANSS total symptoms; one study found a strong negative association (Medina-Pradas et al., 2013) while the other found a small, non-significant, association (Barrowclough et al., 2003). Although limited, there is some evidence that warmth may be associated with better outcomes in terms of overall symptom measures. Both studies did not find a significant association between positive remarks and PANSS total scores.

Positive psychotic symptoms

Of the seven studies that examined warmth and positive symptoms (Mueser et al., 1993; Lopez et al., 1999; Barrowclough et al., 2003; Kuipers et al., 2006; Ramirez and Andreu, 2006; Aguilera et al., 2010; Medina-Pradas et al., 2013), only one found a significant and large association (Medina-Pradas et al., 2013; this was one of the weakest rated studies). Three studies examined whether positive remarks related to positive symptom levels (Barrowclough et al., 2003; Kuipers et al., 2006; Medina-Pradas et al., 2013); no significant relationships were evident.

Negative psychotic symptoms

Five studies tested for a relationship between warmth and negative symptoms; two found a significant association (Barrowclough

et al., 2003; Medina-Pradas *et al.*, 2013) and three did not (Mueser *et al.*, 1993; Lopez *et al.*, 1999; Kuipers *et al.*, 2006). The studies were largely comparable across quality domains, with the exception of confounders. The studies that did not find an association made strong attempts to control for potential confounding variables (e.g. history of illness; other EE dimensions); the medium to large associations found by Barrowclough *et al.* (2003) and Medina-Pradas *et al.* (2013) might reflect other, uncontrolled variables. Findings regarding positive remarks and negative symptoms (Barrowclough *et al.*, 2003; Kuipers *et al.*, 2006; Medina-Pradas *et al.*, 2013) were not significant.

Affective symptoms and general psychopathology

Three cross-sectional UK studies examined whether family warmth was associated with depression in psychosis (Barrowclough *et al.*, 2003; Tarrier *et al.*, 2004; Kuipers *et al.*, 2006). Tarrier *et al.* (2004) found that greater warmth was significantly correlated with lower scores on the Beck Depression Inventory (BDI). In the same sample, Barrowclough *et al.* (2003) did not find an association between warmth and depression measured on the depression sub-scale of the Positive and Negative Syndrome Scale (PANSS-D; Kay *et al.*, 1987). A systematic review found the BDI and PANSS-D to be valid and reliable for measuring depression in schizophrenia, with the BDI having slightly lower sensitivity and specificity than the PANSS-D (Lako *et al.*, 2012). Therefore, the difference in findings does not appear to reflect lower sensitivity of the PANSS-D to depressive symptoms, but it could potentially reflect the reduced specificity of the BDI. The third study failed to find an association with depression measured on the BDI (Kuipers *et al.*, 2006). One potential contributor to the disparity between the two studies that employed the BDI is the clinical characteristics of the samples. Participants in the Tarrier *et al.* (2004) study reported an illness duration of <3 years, most in the first year post-diagnosis, whilst Kuipers *et al.*'s (2006) sample reported a mean illness duration of 11.2 years. As suggested by Lee *et al.*'s (2014) findings, it might be that family warmth may be more strongly related to psychological outcomes in the early course of psychosis. At longer illness durations, factors such as social isolation and medication effects may be more chronic and pervasive. Further work is required to investigate such possibilities. The same three studies also examined the relationship of positive remarks to depression (Barrowclough *et al.*, 2003; Tarrier *et al.*, 2004; Kuipers *et al.*, 2006). No significant associations were found.

Kuipers *et al.* (2006) also examined associations between warmth and positive remarks and participants' scores on the Beck Anxiety Inventory, with neither positive EE sub-scales found to significantly predict anxiety.

Two cross-sectional studies examined associations with PANSS general psychopathology scores (Kuipers *et al.*, 2006; Medina-Pradas *et al.*, 2013). Medina-Pradas *et al.* (2013) found a strong negative correlation with warmth; Kuipers *et al.* (2006) found no significant correlation. With regards to positive remarks and PANSS general psychopathology scores, Medina-Pradas *et al.* (2013) found no significant association but Kuipers *et al.* (2006) found a small positive correlation. Both samples reported similar illness duration and showed similar profiles across the domains of study quality assessed. However, Kuipers *et al.* (2006) demonstrated greater control of confounding variables with a much larger sample, 86 dyads *v.* 21 dyads. Therefore, differences in study quality may potentially contribute to the discrepancies in their findings. A further potential differentiating factor is sample

culture; the Medina-Pradas *et al.* (2013) study was conducted in Spain whilst the Kuipers *et al.* (2006) study was conducted in the UK. As differences in relationships between EE and outcomes have been reported between Mexican-American and Anglo-American samples, this inconsistency raises the question of whether this also applies to other Spanish-speaking samples.

Prodromal symptoms

Three longitudinal studies of ultra-high-risk for psychosis samples examined relationships between warmth and changes in prodromal symptom levels (O'Brien *et al.*, 2006, 2008; Schlosser *et al.*, 2010). Warmth was not found to be a significant predictor of changes in scores on the positive, negative, general psychopathology or disorganised sub-scales of the Scale of Prodromal Symptoms (Miller *et al.*, 2002; Schlosser *et al.*, 2010 only looked at the positive symptoms sub-scale). Effect sizes ranged from trivial to medium. These studies benefitted from longitudinal designs, good control of confounders (with the exception of O'Brien *et al.*, 2006), and appropriate statistical analyses. However, the reliability of relevant outcome measures was not consistently reported and it is worth noting that 38% of participants in Schlosser *et al.* (2010) also took part in O'Brien *et al.* (2006). Two of these studies (O'Brien *et al.* 2006, 2008) also examined associations between positive remarks and prodromal symptoms. Neither found an association with positive prodromal symptom or general psychopathology changes. However, both studies found that higher levels of baseline positive remarks predicted greater reductions in negative prodromal symptoms at follow-up, with large effect sizes. Positive remarks correlated significantly with disorganised prodromal symptoms in the 2006 study, but this was not replicated in the 2008 study.

Suicidality

A single study, Tarrier *et al.* (2004) examined the relationship between warmth and scores on the Beck Scale for Suicide Ideation (BSI; Beck and Steer, 1991) and Beck Hopelessness Scale (BHS; Beck and Steer, 2006), neither of which was significant. Warmth did not relate to whether participants had previously attempted, or expressed desire for, suicide. Furthermore, positive remarks were not associated with overall scores on the BSI or BHS, and it did not discriminate between those with/without previous suicide attempts. However, relatives' rates of positive remarks were significantly higher amongst participants with no desire for suicide, compared with those who reported some desire for suicide. Positive remarks were the only EE dimension associated with suicidal ideation. Replication of this finding using stronger study designs is needed.

Self-esteem

Two cross-sectional studies examined participants' self-esteem and warmth (Barrowclough *et al.*, 2003; Kuipers *et al.*, 2006). Kuipers *et al.* (2006) found no association. Barrowclough *et al.* (2003) used a scale capturing positive and negative evaluations of self and found no significant associations between warmth and negative/positive self-evaluation. However, greater warmth was associated with higher positive evaluation of role performance, suggesting that aspects of self-esteem may be related to warmth. Barrowclough *et al.* (2003) and Kuipers *et al.* (2006) did not find associations between positive remarks and self-esteem.

Social functioning

Four studies examined the relationship between warmth and social functioning; three studies were conducted in at-risk groups (O'Brien *et al.*, 2006, 2008; Schlosser *et al.*, 2010) and one in schizophrenia (King and Dixon, 1999). The at-risk studies all found an association between greater warmth and better social functioning; although, Schlosser *et al.* (2010) found that warmth interacted with EOI such that improvements in social functioning were predicted by greater warmth when EOI was moderate. The relationship between warmth and improvements in functioning found by O'Brien *et al.* (2008) was specific to functioning in the social domain and replicated an earlier finding (O'Brien *et al.*, 2006) in a slightly larger sample. Large effects were found in both studies.

The one study in a sample diagnosed with schizophrenia provided the only evidence within this review of higher warmth predicting poorer outcomes. King and Dixon (1999) measured participants' functioning across a variety of domains. In analyses controlling for participants' level of symptoms, maternal warmth was not predictive of any outcome measures. Paternal warmth was significantly related to general social adjustment and household member functioning, which was also predicted by average household warmth levels. In each instance, higher levels of warmth predicted worse functioning. Higher warmth might reflect greater tolerance of the unwell relative's difficulties and a concurrent lowering of expectations. Three of the studies that examined social functioning also included positive remarks as a predictor (King and Dixon, 1999; O'Brien *et al.*, 2006, 2008). The two studies in at-risk groups found no significant associations (O'Brien *et al.*, 2006, 2008). However, King and Dixon (1999) found that paternal positive remarks predicted functioning in several domains. These associations were positive, unlike findings for warmth, with higher paternal positive remarks predicting better general social functioning and functioning as a household and external family functioning. The relationship with household and external family functioning was also significant when average household positive remarks were used as a predictor. Maternal positive remarks did not significantly predict any areas of functioning.

Health and life satisfaction

One study examined the relationship between warmth and physical, mental and general health at 13-month follow-up (Breitborde *et al.*, 2007) in Mexican-American participants. No significant associations with warmth were found; although, findings may have been influenced by the relatively high dropout rates. The study with the largest sample in the review was the single study that employed life satisfaction as an outcome measure (Greenberg *et al.*, 2006). Greenberg *et al.* (2006) found that warmth was a significant predictor of life satisfaction, even when participants' gender, age, level of depressive symptoms, level of functioning and number of close friends was taken into account. Positive remarks also significantly predicted life satisfaction, even with the aforementioned potential confounders accounted for. The association with life satisfaction was larger for warmth (medium effect) than positive remarks (small effect).

Discussion

This review aims to summarise and evaluate research examining the relationship between warmth and positive remarks and

outcomes in psychosis. The 27 studies included in the review incorporated a range of outcome measures, but most commonly relapse. The only study in first-episode psychosis provided relatively strong evidence that higher warmth was associated with lower relapse at follow-up; although, this finding requires replication. In samples with chronic psychosis, there is some evidence that within Mexican-American and European samples, warmth may predict relapse. However, there is no evidence for an association beyond 9-month follow-up and even up to 9 months some studies did not find an association. Although linear relationships emerged in some studies, the possibility of whether the relationship between warmth and relapse may be better characterised as curvilinear has been suggested, with none of the studies with null findings investigating this possibility. The relationship between positive remarks and relapse has only been explored in a small subset of studies, with no studies finding evidence of an association to date. Studies assessing outcomes in terms of symptomatology have shown inconsistent findings in relation to both warmth and positive remarks. Where evidence for associations does exist, there is a lack of corroboration across studies. In cases where relationships with symptoms have been found, this has tended to emerge on overall and negative symptom measures, with no evidence at this stage for an association with positive symptoms. Evidence for associations between positive EE dimensions and social functioning has emerged, primarily in at-risk groups. There is also evidence that warmth and positive remarks predict life satisfaction but, again, this finding requires replication.

Theoretical and clinical implications

Some of the included prospective studies yielded tentative evidence for protective effects of positive EE dimensions. This does not preclude the possibility that warmth or positive remarks may interact with factors such as symptomatology and functioning over time. Indeed, a bidirectional relationship seems likely and is widely accepted in the case of negative aspects of EE (Hooley, 2007). Whether such a reciprocal relationship with positive EE dimensions exists requires further study. A stronger relationship between improved outcomes and positive EE dimensions is evident in the early course of psychosis. Factors likely to predict poor outcomes (e.g. diminishing social networks; reduced occupational functioning), together with reduced chronicity of comorbid difficulties such as social anxiety, low mood and substance use (McGorry and Yung, 2003), may mean that there is greater potential for protective effects of positive family environments earlier in psychosis.

Differences in relationships between positive EE dimensions and outcomes across different stages of psychosis also emerged when examining social functioning. Warmth predicted improved social functioning at follow-up in at-risk samples (O'Brien *et al.*, 2006; 2008; Schlosser *et al.*, 2010), but poorer social functioning at follow-up in schizophrenia (King and Dixon, 1999). This could reflect a lowering of expectations in families where greater warmth was expressed (King and Dixon, 1999). Although the latter study did not only differ from the at-risk studies in terms of sample characteristics, it is possible that, whilst the family attitudes and behaviours captured on the CFI warmth sub-scale may be conducive to better social functioning in early psychosis, the same affective attitudes and behaviours may have inadvertent negative effects in some domains when difficulties are more chronic.

Very few studies considered which relative was rated on the CFI. Three studies of relapse analysed maternal and paternal

scores with outcome separately, with no differences based on which parent's scores were used (Parker *et al.*, 1988; Ivanović *et al.*, 1994; King and Dixon, 1999). It may be that the parental differences in predicting outcome are specific to social functioning, but this requires further investigation. The majority of relatives included in studies were parents, but spouses, siblings and other informal caregivers were also represented. Given that higher levels of warmth have been identified in caregivers who are not parents of the person with psychosis (Bentsen *et al.*, 1998), future studies may wish to the nature of the relationship measured into account.

Higher levels of warmth and positive remarks are not synonymous with low EE. Some included studies found protective effects of warmth, even within the context of high EE (Bertrando *et al.*, 1992). Others have suggested that protective effects may be most likely in the context of high warmth and moderate EOI (Breitborde *et al.*, 2007). Whilst studies of FIs have less commonly stated increased positive EE as an explicit aim (compared with say, reduced criticism), it often constitutes an important element of such interventions. For example, problem-solving and emotion regulation FI components focus heavily on increasing warmth (e.g. Kuipers, Leff, and Lam, 2002). The current results support continued emphasis on fostering positive aspects of EE within FIs.

Limitations

Firstly, the observational nature of the evidence-base prohibits strong conclusions regarding causal relationships. Secondly, the reliability of the warmth and positive remarks sub-scales has previously been questioned, with claims that this may lead to an underestimation of relationships with outcome (Bentsen *et al.*, 1996). However, reported reliabilities always exceeded an acceptable rate, apart from a study using the CFI (Japanese version; Ito and Oshima, 1995), which found acceptable inter-rater reliabilities for warmth but not positive remarks (neither scale related to relapse). In studies that did not report inter-rater reliabilities, there was no systematic relationship with whether study findings. Therefore, reliability of the predictor measures does not seem to have been a major limitation of included studies. Thirdly, EE dimensions have been shown to vary cross-culturally (Swaran Kymalainen and Weisman de Mamani, 2008; Singh, 2011). Most studies reviewed were conducted within the UK or USA. Whilst cross-cultural differences do not appear to explain the inconsistencies of findings within the current review, further investigation is required to draw firmer conclusions about broader cultural relationships. Fourthly, the mechanisms by which warmth and positive remarks may potentially exert protective effects have yet to be addressed. There are also some limitations to the current review itself. We did not review the grey literature and included only English language articles; findings might therefore be susceptible to language and publication bias. Also, warmth and positive remarks as measured on the CFI are unlikely to wholly capture the many potential positive aspects of family environments. Furthermore, despite being the gold standard EE measure, the CFI has been criticised for being labour-intensive and questions have been raised as to the underlying constructs the CFI taps (Hooley and Parker, 2006). We did not analyse results based on ethnicity of participants within samples. This is a limitation of the review, as the impact of warmth has been shown to vary cross-culturally (e.g. López *et al.*, 2004) and therefore this may have provided further insights into relationships between EE and different outcomes. Intervention trials that saw

an increase in warmth and concomitant decrease in symptomatology but did not test for a relationship between the two were excluded from the current study. This was necessary as a presumption of a direct relationship between such changes on our part would potentially be unfounded. However, there is evidence to suggest that positive EE dimensions may be predictive of outcomes, not only in individuals with psychosis, but also their caregivers (Breitborde *et al.*, 2007). Consideration of outcomes in caregivers was beyond the scope of the current review but is needed. Improving the lives of people with psychosis clearly goes beyond solely minimising relapse rates. It was on this basis that we employed broad inclusion criteria in terms of what constituted an eligible outcome. The breadth of studies included is a strength of the review in this regard. However, the heterogeneity of included studies in terms of outcome measures, sample clinical and demographic variables, study quality and designs confounded potential meta-analysis of the data.


Future research

Inclusion of the positive EE dimensions in further well-controlled prospective cohort studies with multiple follow-up points measuring both symptomatology and functioning will help researchers draw firmer conclusions about their relationship with outcomes. For example, studies in at-risk samples could assess whether the predictive relationship found between baseline warmth and follow-up social functioning provides further protective effects in terms of symptomatology at later follow-up. Knowledge of the potential mechanisms underlying protective effects using experience sampling, for example, could help provide information regarding temporal relationships between positive EE dimensions, functioning and symptomatology. Single-symptom approaches and controlled experimental studies in non-clinical samples can also contribute to furthering understanding of relationships between positive EE factors and psychosis outcomes.

Note

¹ Leff *et al.* (1987) and (1990) report 1-year and 2-year data from the same study and are therefore referred to as one study.

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