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**Social rank theory of depression: A systematic review of self-perceptions of social rank and their relationship with depressive symptoms and suicide risk**

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## **Abstract**

*Background:* Depression is a debilitating illness which is also a risk factor for self-harm and suicide. Social rank theory (SRT) suggests depression stems from feelings of defeat and entrapment that ensue from perceiving oneself of lower rank than others. This study aims to review the literature investigating the relationship between self-perceptions of social rank and depressive symptoms or suicidal ideation/behaviour.

*Methods:* A keyword search of three psychological and medical databases was completed (Psychinfo, Medline, Web of Knowledge). Studies were quality assessed using established criteria.

*Results:* An initial 1290 records were identified. After application of inclusion and exclusion criteria, 70 remained measuring depressive symptoms (n=68), self-harm (n=3) and suicidal ideation (n=3). The main measures assessing social rank were the social comparison scale (SCS; n = 32) and subjective social status (SSS, n = 32), with six additional papers including another measure of social rank. In univariate analyses, as perceptions of social rank decreased, depressive symptoms (and suicidal ideation/ self-harm) increased. Multivariate analyses indicated that social rank may act as a psychosocial mechanism to explain the relationship between social factors (in particular socio-economic status) and depressive symptoms. Additionally, psychological variables, such as rumination or self-esteem, may mediate or moderate the relationship between social rank and depressive or suicidal symptoms.

*Limitations:* Study quality was variable and 89% of studies were cross-sectional.

*Conclusions:* Although more prospective research is required, this review highlights the importance of understanding an individual's perception of their social position compared to others as it may lead to an enhanced understanding of the aetiology of depression.

*Key words:* social rank theory, social comparison, depression, suicide, self-harm

## 1. Introduction

Globally, more than 300 million people suffer from depression (WHO, 2017). It is the most prevalent mental health problem worldwide (GBD, 2015), with the incidence of depressive disorders notably higher in women than in men (Piccinelli and Wilkinson, 2000). Depression is often described as an overwhelming sadness, despair and hopelessness that can last for months or years (e.g., Ferrari et al., 2013). Examples of symptoms include, but are not limited to, a loss of energy, appetite and self-confidence (Mental Health Foundation, 2018). It is a debilitating illness, with findings from the Global Burden of Disease Study indicating that depression is the second leading cause of years lived with a disability (Ferrari et al., 2013). Depressed individuals are at an elevated risk of suicide, with more than 90% of those who die by suicide estimated to have a diagnosable psychiatric disorder (Conwell et al., 1996), and a history of self-harm (defined as non-fatal self-injury) being a strong predictor of dying by suicide (Carroll et al., 2014).

Due to the debilitating nature of depression, much research has been employed to identify factors contributing to its aetiology; these include biological, environmental, social and psychological variables (Gotlib & Hammen, 2014). One area, in particular, that is pervasively linked to depression is socio-economic status (SES), with substantial evidence that the more disadvantaged are disproportionately affected by mental health problems and their adverse consequences (Patel et al., 2010). Findings from a meta-analysis indicate that those of lower SES are at a higher risk of experiencing depression in their lifetime (odds ratio = 1.81; Lorant et al., 2003). Low income, a gross marker of SES, has also been shown to be related to psychopathology, including suicidal ideation (McMillan et al., 2010). A mechanism for this link may be psychosocial as well as material; indeed emerging research suggests absolute level of income is not a direct causal factor for adverse mental health outcomes, rather the rank of income compared to others within a similar social comparison group appears to be important (Hounkpatin et al., 2015; Wetherall et al., 2015). Indeed, subjective measures of social status are related to several poor health outcomes, including depression

(Euteneuer, 2014; Hoebel et al., 2015). The corollary of these findings is that the extent to which individuals perceive themselves to be ranked negatively compared to others, and by others, may be pertinent to understanding how lower social status is associated with more depressive symptoms and suicidal thoughts.

The social rank theory of depression is an evolutionary theory that endeavours to account for the social rank–mental health relationship (SRT; Price, 1972; Stevens and Price, 2000). Evolutionary perspectives propose that the symptoms of depression serve an adaptive function stemming from defensive shutdown strategies, whereby low mood may be useful for dealing with unfavourable situations (Gilbert, 2001; Nesse, 2000). Adaptive functions may include reducing effort towards unachievable goals or unsuccessful activities (Klinger, 1975) or as a means of dealing with lost or threatened attachment relationships (Bowlby, 1980). SRT proposes that low mood and submissive behaviour is a response to defeating situations, such as losing rank within a social hierarchy, that occur as a means of signalling to dominant others they no longer wish to challenge in the competition for resources (i.e., for food or mates) (Price et al., 2007). This is reflected in the inferiority, submissiveness and self-criticism that is indicative of depression states (Gilbert, 2001).

Within the ethological literature there are many instances of animals becoming withdrawn and subordinate to others as a means of signalling they do not want to compete, aimed at reducing the risk of injury or death from unsuccessful conflicts (e.g., Price and Sloman, 1987; Taylor et al., 2011). This adaptive reaction leads to a stress response in the subordinate individual (Abbott et al., 2003), with elevations in the stress hormone cortisol as the hypothalamic-pituitary-adrenal axis (HPA) is activated, and this stress response may be modulated by the social environment, in particular with isolation from others (Ruis et al., 2001; Ruis et al., 1999). Social defeat effects may also impact additional physiological processes, such as reduction in the neurotransmitter dopamine's transporter (DAT) binding (Isovich et al., 2001) and the dysregulation of innate immune responses (Ambrée et al., 2018). When the defeating situation persists and there is no means of escape, the

animal feels trapped (entrapment) and the stress response may become chronic, known as *arrested flight* (i.e., the flight instinct of the autonomic nervous system is suppressed, Dixon et al., 1989).

These concepts, particularly defeat and entrapment, have been extended to humans to help understand the development of mood disorders such as depression, as well as suicidal behaviour (O'Connor et al., 2016b; Taylor et al., 2011), with evidence that a desire to escape is common in those with depression (Gilbert et al., 2004). Arguably severe depression is more pervasive than low mood and submissive behaviour, and therefore not adaptive, but it is when the situation is not accepted or changed, or is inescapable, that serious pathology can develop (Nesse, 2000). Therefore the adaptive defensive functions then become maladaptive, particularly when defences are aroused, blocked or ineffective (Gilbert, 2001). Similarly, *arrested anger* (i.e., suppression of the fight response) has also been linked to depression, with evidence that suppressing feelings of anger is common and often pre-dates depression (Gilbert et al., 2002) and self-harm (Clarke et al., 2016). Additionally, mood variation in patients with bipolar has been closely linked to social rank evaluations, and this may be evidence of a maladaptive instability in social rank (Gilbert et al., 2007c)

These adaptive mechanisms evolved out-with our modern society, which may create more triggers for maladaptive responses. For humans the need to succeed in social arenas may be particularly pertinent, as perceptions of lower rank may impact upon finding a partner, having a successful career and forming friendships (Gilbert, 1997), and therefore the need to be accepted, feel attractive and be valued by others are the modern day 'competition for resources'. Psychological factors such as external shame (perception of feeling inferior in the minds of others), self-criticism, striving to avoid inferiority and rumination about feeling inferior are associated with social rank (Cheung et al., 2004; Gilbert et al., 2007a; Gilbert et al., 2010), this implies that internal thinking may be a crucial factor in the activation and maintenance of the dysregulation of these defensive strategies (Gilbert, 2001).

In a systematic review and subsequent meta-analysis, the social rank concepts of defeat and entrapment were consistently linked to depressive symptoms across both clinical and non-clinical samples (Taylor et al., 2011; Siddaway et al., 2015). Indeed, considerable focus in the SRT literature has been upon defeat and entrapment, with the process of making social rank judgements (i.e., the action of comparing oneself to others and the resulting perception of rank) being largely overlooked. Importantly, social rank judgements are the mechanism by which individuals assess their position within a social group, arguably a key aspect of SRT (Gilbert et al., 1995a). Therefore, this paper extends this research by systematically reviewing the literature on the relationship between perceptions of social rank and depressive symptoms, including self-harm and suicidal ideation as potentially lethal outcomes of depression.

### *1.1 Measuring self-perceptions of social rank*

Within the animal research literature, social rank is assessed by monitoring an animal's behaviour within their social group (e.g., Abbott et al, 2003). Arguably a major advantage of research with humans is that it is possible to evaluate an individual's self-perception of their social rank. Measures have been developed that directly assess how an individual ranks themselves compared to others on particular social or economic dimensions. The SRT literature primarily uses the social comparison scale (SCS; Allan and Gilbert, 1995) that asks individuals to rank themselves compared to others on 11 bipolar constructs using a semantic differential approach, thereby ranking themselves from a more negative attribute (e.g., feeling left out) to a more positive attribute (e.g., feeling accepted). The constructs have three overarching dimensions; the *rank* dimension includes concepts associated with evolutionary theory reflecting ideas of inferiority (e.g., weaker – stronger), the *social attractiveness* dimension covers desirability (e.g., unattractive – more attractive), and the *group fit* dimension includes how a person judges themselves to fit in with others (e.g., outsider – insider). The overall score conveys an individual's perception of themselves compared to others across the

dimensions, with a higher score indicating a higher perceived rank. The SCS is associated with other key social rank variables, including defeat and entrapment (Gilbert and Allan, 1998).

Another measure assessing individuals' perception of themselves compared to others is subjective social status (SSS; e.g., Adler et al., 2008), and this is often used in epidemiological literature assessing subjective perceptions of SES. Developed by the MacArthur Network on SES & Health (MacArthur-Foundation, 2008), the SSS aims to capture individuals' sense of their place in society accounting for multiple dimensions of SES. Specifically, individuals place themselves on a *social ladder* representing where people stand in society, with those at the top being best-off (most money, most education, and most respected jobs) and those at the bottom being worst off (Adler et al., 2008). The one-item measure is framed within different contexts, with individuals asked to compare to others within their community, their country, or society more generally. SSS has been shown to be associated with markers of SES (e.g., Dennis et al., 2012) and health more generally (e.g., Miyakawa et al., 2012). SCS and SSS are the most frequently used measures of social rank, however, in this review, we aimed to include any construct that directly measured an individual's perception of their rank compared to others.

## **1.2 Aims of this systematic review**

In short, although SRT is a prominent theory of depression, there has yet to be a review of the evidence that feeling of lower social rank compared to others is related to depressive symptoms, suicidal ideation or self-harm. The aim of this review is to investigate (i) the nature and extent of the relationship between social rank and depressive symptoms (including suicide and self-harm) and (ii) whether there is evidence for any mediators or moderators of the relationship between social rank and depressive symptoms (including suicide and self-harm).

## **2. Methods**

### *2.1 Search strategy*



A literature review of the three main psychological and medical databases was conducted by searching three relevant databases; Psychinfo (1887—November 2017), Medline (1966— November 2017), and Web of Knowledge (1981— November 2017). Key word searches using the following terms were employed: (i) “depress\*” OR “suicid\*”OR “self-harm\*”; (ii) "subjective social status" OR "subjective social position" OR "social rank" OR "social comparison\*". The PRISMA guidelines (PRISMA, 2015) were followed, namely to identify appropriate papers the titles of all studies generated were initially screened by the first author, then the abstracts and finally the full texts (see Figure 1).

## *2.2 Inclusion and exclusion criteria*

The inclusion criteria included papers that (i) were original, published journal articles, (ii) included a measure of self-perception of social rank compared to others, (iii) included a measure of depressive symptoms and/or suicidal ideation or self-harm, (iv) documented the relationship between social rank and depressive symptoms/ suicidal ideation or self-harm, (v) were written in English, and (vi) had an adult sample (18 years +). Additionally, papers were excluded when; a) the primary focus was eating disorders or appearance as a review has previously been completed (see Myers and Crowther, 2009), b) physical health was the comparison factor as this changed the nature of the research question, c) studies had a neurobiological focus that was not relevant; d) they reported comparison tendency rather than perceived rank; and c) the participants had a diagnosis of psychosis thereby changing the focus of the study to social rank of auditory hallucinations. Any uncertainty in inclusion was discussed with the co-authors until a consensus was reached. Due to the already large scope of the review, it was agreed among the authors that only published papers would be included, therefore there is some risk of publication bias within the results.

## *2.3 Data extraction and quality assessment*

For ease of interpretation, a data extraction sheet was completed for each paper, including; study design, sample, demographics, key measures, main results, and the authors' interpretation of their findings. A meta-analysis was not conducted as the measures of social rank were heterogeneous. All of the studies underwent a quality assessment, based upon previous quality tools (e.g., O'Connor et al., 2016a) the papers were assessed for design, sample, assessment of key variables (i.e., depressive symptoms, social rank) and inclusion of confounding variables in their analyses. As most papers included other analyses, assessments were based only on the analyses relevant to this review. Classifications of quality were set as follows: 0-2 = very low quality, 3-4 = low quality, 5-6 = reasonable quality, 7-8 = good quality, and = 9-11 excellent/very good quality. Initial quality assessments were conducted by the first author, and then were discussed with all co-authors.

### **3. Results**

The searches generated a total of 1290 studies, and after duplicates were removed 591 remained. Figure 1 describes the screening process, with the final sample (n=70) including one paper found in a reference search of the eligible papers. Due to the inherent differences in the primary measures of social rank identified, the papers were synthesized by the measure included. In sum, 32 papers utilised the social comparison scale (SCS; Table 1), 32 papers used subjective social status (SSS; Table 2) and a further six used other indicators of social rank (Table 3).

#### *3.1 Study characteristics*

Studies were primarily from the UK (n=27, 38%) or the USA (n=27, 38%); SCS studies were typically UK based (n=21), while the SSS papers were generally from the USA (n=22). The remaining countries were mainly from North America or Europe; including Canada (n=4), Germany (n=3), Portugal (n=2), Israel (n=2), Switzerland (n=1) and Sweden (n=1). Only two studies were from China, and two were from the African continent (Kenya and South Africa).

The studies incorporated a range of measures of depressive symptoms (n=68); including established scales such as the Centre for Epidemiological Studies-Depression scale (n = 25, CES-D; Radloff, 1977) and the Beck Depression Inventory (n = 13, BDI; Beck et al., 1996), as well as full diagnostic interviews like the Mini-International Neuropsychiatric Interview (M.I.N.I.; Sheehan et al., 1998), or individual items tapping history of major depressive episodes (MDE; e.g., Alcantara et al., 2014) or depressed feelings (Antony et al., 2005). An additional three studies (Gilbert et al., 2009; Gilbert et al., 2010; Williams et al., 2009) measured self-harm with the self-harm inventory (SHI; Sansone and Sansone, 2010). Three measured suicidal thoughts (Goodman et al., 2015; Zvolensky et al., 2016; Zvolensky et al., 2017) using the modified scale for suicide ideation (MSSI; Pettit et al., 2009) and the suicide subscale of the inventory of depression and anxiety symptoms (IDAS-suicide; Watson et al., 2007). No papers were identified that directly measured suicide attempts.

The sample populations across the studies were heterogeneous, with the psychologically-oriented SCS papers employing student (n=20), clinical (n=16) or community/ general population (n=4) samples (or a combination of both). In contrast, the more epidemiologically-focused SSS studies tended to recruit samples with particular demographics, for example older adults (n=3), Latino/Latin Americans (n=10), Asian Americans (n=3), or pregnant/post pregnant women (n=4), with the general population samples (n=12) often analysed by demographics such as gender or ethnicity. The SSS context varied; primarily individuals were asked to compare to others in their country (mainly SSS-USA, n=20), community (SSS-community; n=13) or society more generally (SSS-society; n=8). The studies with other measures or manipulations of social rank recruited a variety of samples, three recruited clinical and non-clinical samples, the remainder were students, migrant workers and older adults.

### *3.2 Quality assessment overview*

No papers were of very low quality. The SCS papers (Table 1) were mainly assessed as low (n=14, 43.8%) or reasonable quality (n=15, 46.9%), with only two studies assessed to be good and one

excellent quality. In contrast, only two of the SSS papers (Table 2) were found to be of low quality, with the rest assessed as reasonable (n=14, 43.8%) or good (n=15, 46.9%), and again only one SSS study was rated as excellent quality. Of the papers using other measures of social rank (Table 3), the majority were of reasonable quality (n=5, 83.3%), with one of low quality. This indicates that generally the SSS papers were of higher quality than the papers utilising SCS or other measures of social rank.

The relatively low quality ratings are reflected in the fact that the majority of studies reported cross-sectional analyses (n=62, 89%). Studies varied on aspects such as sample size, recruitment methods and analyses, with the SCS studies often recruiting smaller (range n=40 to n=385) convenience samples in universities or in-patient units. In contrast, the SSS studies often had larger samples (range n=56 to n=10,828) drawn from cohorts, therefore employing more rigorous recruitment methods. Additionally, the SSS papers tended to use complex analyses accounting for more covariates (in particular SES factors), while the SCS analyses included fewer covariates (more psychological measures, e.g., defeat and entrapment). Only four studies included a prospective analysis (Dolbier et al., 2013; Feinstein et al., 2013; McGovern and Nazroo, 2015; Sturman and Mongrain, 2008), including both of the studies meeting the criteria for excellent quality. Of the remaining papers there were two experimental studies, one case control and one diary method. Arguably the predominantly cross-sectional research may highlight a lack of diversity in terms of study designs within this area.

### **3.3. Nature and extent of the relationship between social rank variables and depressive symptoms or suicide/ self-harm: univariate analysis findings**

#### *3.3.1 SCS univariate findings*

All of the studies reported a significant negative correlation between SCS and depressive symptoms (except where SCS was reversed scored; Feinstein et al., 2013), indicating that as an individual's

perceptions of their social rank compared to others increases, depressive symptoms tended to decrease (or vice versa). In total, 48 correlations (Pearson's  $r$ ) were reported, and, based on operational cut-offs (Cohen, 1992), these ranged in size from small to large (range,  $r = -0.22$  to  $-0.80$ , mean  $r = -0.45$ ). This association remained when using the subscales (Dunn et al., 2012), when perceiving a reduction in rank (Olive and Brewer, 2014), as well as comparing to others on social media (Feinstein et al., 2013; Lup et al., 2015). Community and general population samples appeared to report lower average  $r$  values ( $n=9$ ; mean  $r = -0.35$ ) than students ( $n=20$ ;  $r = -0.42$ ), and students lower than clinical samples ( $n=18$ ;  $r = -0.49$ ). Although not tested statistically, this difference is supported by the case control study finding significantly larger effect sizes for depressed patients ( $r=-0.60$ ) compared to non-depressed controls ( $r=-0.33$ ; Carvalho et al., 2013); therefore the association between SCS and depressive symptoms may be larger in those with a psychiatric diagnosis (primarily depression).

#### *3.3.1.1 Self-harm and SCS univariate findings*

Three studies investigated the relationship between SCS and self-harm (Gilbert et al., 2009; Gilbert et al., 2010; Williams et al., 2009). Each reported a significant negative relationship, indicating that feeling of a lower rank compared to others was associated with more self-harm. The mean Pearson's  $r$  value ( $r = -0.33$ ) appeared smaller than for depressive symptoms ( $r = -0.45$ ), with the two clinical population sample studies again reporting larger  $r$  values ( $r = -0.36$ ,  $-0.34$ , respectively) than the student group ( $r = -0.28$ ). Although not formally tested and based on only three studies, there is some evidence that social rank may be more strongly related to depressive symptoms than self-harm, particularly in clinical groups.

#### *3.3.2 SSS univariate findings*

Table 2 indicates that 25 (78%) SSS papers reported univariate analyses, this was either the association between the variables via correlations ( $n=14$ ) and regressions ( $n=3$ ), or the prevalence of

depressive symptoms at different levels of SSS (n=8). Similar to SCS, the direction of the relationship consistently indicated that when individuals perceived having a higher SSS, depressive symptoms tended to be lower. Due to different samples and contexts, the correlation papers reported 50 r-values, with sizes ranging from very small to medium (range,  $r = -0.01$  to  $-0.44$ , mean  $r = -0.22$ ), although nearly half were non-significant (n=22). The SSS-USA context (n=24) had a slightly larger mean correlation coefficient ( $r = -0.27$ ) than SSS-community (n=21,  $r = -0.21$ ) and SSS-society (n=2,  $r = -0.20$ ), although not tested statistically. In terms of demographic characteristics, there was some indication that Black American participants yielded a larger r-value ( $r = -0.36$ ) than other ethnic groups (e.g., Latinos, mean  $r = -0.14$ ), while male samples had larger average r-values (mean  $r = -0.31$ ) than female samples (mean  $r = -0.15$ ), although the only non-significant correlations were in samples of females. Additionally, all three studies using regression analysis found a significant association between a measure of SSS and depressive symptoms; including in a low income sample (Hamad et al., 2008), and two female only samples (Lau et al., 2013 ; Michelson et al., 2016). Although, when analysing by ethnicity, Michelson et al. (2016) found a significant association for just Black women on the SSS-community scale, suggesting that social status within the community may be pertinent for this group.

Perceiving oneself to be higher on the SSS ladder was consistently associated with lower prevalence of depressive symptoms (e.g., Adler et al., 2008), with the relationship replicated across different samples (e.g., older adult, pregnant women), SSS contexts (majority used SSS-society scale) and even an experimental manipulation inducing lower SSS increased prevalence of depressive cognitions (Schubert et al., 2016). Generally women tended to have higher prevalence rates of depression than men, and, in one study, for example, men higher on SSS had a depression prevalence of 0.7%, with the comparable figure for women being 7.5% (Hoebel et al., 2017).

### *3.3.2.1 Suicide ideation and SSS univariate findings*

Of the three studies with a measure of suicidal ideation, two recruited Latino samples living in the USA; in one, no significant correlation between suicidal ideation and SSS-USA was found (Zvolensky et al., 2017a) and the other, focusing on a low income sample, found a significant but small r-value ( $r=-0.15$ , Zvolensky et al., 2016). Therefore the relationship between suicidal ideation and SSS may be more pronounced for those with a lower SES. For young men in semi-rural Kenya, those perceiving a lower SSS were significantly more likely to report suicidal ideation than those with a higher SSS (Goodman et al., 2017). Overall, there appears to be a relationship between SSS and suicidal ideation, although the latter may not be as strong as that with depressive symptoms.

### *3.3.3 Univariate findings using other social rank measures*

Half ( $n=3$ ) of the studies using other measures of rank included a univariate analysis, with two including the main effects from an ANOVA and one correlations, and all found depressive symptoms to be associated with a lower perception of some domain of social rank. Among older adults in Hong Kong asked to compare to people of a similar age, depressive symptoms were significantly correlated with lower rank in the domains of financial situation and friendship, but not with their relationship with their adult children, although the correlation values were not reported (Chou et al., 2001). In a diary study participants indicated increased depressive ratings (and reduced happiness) directly after comparing themselves to someone perceived to be better off than them on any comparison dimension (e.g., quality of relationships, achievements) (Antony et al., 2005). Finally, only depressed participants ranked themselves as unhappy compared to both an attractive and non-attractive Facebook profile owner, potentially indicating perceived inferiority (Appel et al., 2015).

## **3.4 Nature and extent of the relationship between social rank variables and depressive symptoms or suicide/ self-harm: multivariate analysis findings**

### *3.4.1 SCS multivariate findings*

Just over half (n=18) of the SCS papers included a multivariate analysis of the relationship between SCS and depressive symptoms (Table 1), with thirteen including a simple regression and five using structural equation modelling (SEM). Over half (n= 8, 61.5%) of the papers with simple regression found at least one significant association between the SCS and depressive symptoms when controlling for other psychological factors (Brewer and Olive, 2014; Gilbert, 2000; Gilbert and Allan, 1998; Gilbert et al., 1995a; Gilbert et al., 2007a; Lup et al., 2015; O'Connor et al., 2002; Sturman and Mongrain, 2005). Just one of these papers tested SCS as the outcome, finding depressive symptoms were significantly associated with SCS when controlling for feelings of self-criticism and dependency (Sturman and Mongrain, 2005). This highlights potential bi-directionality in the relationship between social rank and depressive symptoms, although with the cross-sectional design causality cannot be assumed. The remaining papers operationalised depressive symptoms as the outcome, controlled mainly for psychological variables such as submissive behaviour and striving to avoid inferiority (Gilbert et al., 2007a), anxiety symptoms and interpersonal dependency (Brewer and Olive, 2014), survivor guilt (O'Connor et al., 2002) and shame (Gilbert, 2000). Most of these significant findings were drawn from general population or student samples, and therefore there may be some variability by sample.

Studies employing both clinical and student samples had some mixed findings, with two finding a significant multivariate association in the clinical group; one using a relatively contentious backward elimination hierarchical regression (Gilbert et al., 1995a) and the other controlling for submissive behaviour only (Gilbert and Allan, 1998). In contrast, two studies found SCS was significantly associated with depressive symptoms in the student group only; one included shame-related variables (Gilbert et al., 2000) and the other focused on a measure of survivor guilt which was significant for the depressed group only (O'Connor et al., 2002). Potentially factors such as shame and guilt were more pronounced in the clinical group, therefore accounting for more variance in depressive symptoms and reducing the influence of social rank. Indeed, two further studies with clinical samples found SCS was not related to depressive symptoms, or self-harm, when accounting



for attachment (Gilbert et al., 2007a) and self-persecution (Gilbert et al., 2010), and arguably these factors may also be more pertinent for those with a clinical diagnosis such as depression.

Defeat and entrapment appeared important in relation to depressive symptoms across both student and clinical samples (e.g., Gilbert and Allan, 1998; Wyatt and Gilbert, 1998). Indeed in the only case control study, SCS did not differentiate membership of the depressed vs. non-depressed groups, whereas feelings of defeat and internal entrapment did (Carvalho et al., 2013). Additionally, in a path analysis SCS was no longer associated with anhedonic depression in a combined students and in-patient sample, whereas defeat was, and the only prospective regression (depressed student sample) indicated a variable combining SCS and entrapment scores significantly predicted recurrence of depression at 16 months (Sturman & Mongrain, 2008). Overall, these findings suggest that when other pertinent psychological variables are controlled for, the relationship between SCS and depressive symptoms is weakened, and this also highlights potential mechanisms for this association (explored in the mediation and moderation section below).

### *3.4.2 SSS multivariate findings*

The majority of SSS papers (Table 2) utilised a multivariate analyses (n=28, 87.5%) of the relationship between SSS and depressive symptoms, including three with suicidal ideation as the outcome. The majority used simple regression models (n=24), four used SEM, and one experimental study used an ANOVA. All SSS papers using simple regression reported at least one model with a significant association between SSS and depressive symptoms, predominantly when controlling for basic demographic characteristics (e.g., age, gender) and indicators of SES (e.g., income, class), rather than more psychologically-oriented factors. Consistent with the univariate findings, depression risk was higher in individuals who perceived themselves to be lower on the SSS ladder. Again, SSS was the outcome variable in one regression analysis rather than depressive symptoms, with findings indicating a significant association between depressive symptoms and SSS-USA when controlling for interactions of race, education and sex (Shaked et al., 2016). This suggests again that the relationship

may be bi-directional, supported by the best fitting model in an SEM analysis (controlling for SES and health factors) was depressive symptoms affecting SSS (Garbarski, 2010).

In studies reporting findings by gender, generally the effect held for both men and women in analyses including SES variables such as occupation, wealth and education (Singh-Manoux et al., 2003, Adler et al., 2008, Demakakos et al., 2008, Cundiff et al., 2011, 2013, Miyakawa et al., 2012, Hoebel et al., 2017). Differences included an indication that SSS-community may be more important for older women (Cundiff et al., 2013) and education may not have as much of an impact on depressive symptoms for women in the civil service (Singh-Manoux et al., 2003) whereas for men a range of SES factors may be pertinent (Adler et al., 2008). Generally the effect size of the relationship between SSS and depressive symptoms appeared larger for women compared to men (e.g., Singh-Manoux et al., 2003; men,  $R^2 = 1.78$ ; women,  $R^2 = 2.65$ ), possibly indicative of higher rates of depression in women. However, in a higher quality study the effect size appeared larger for men, as men lower on the SSS ladder were 1.62 times more likely to experience a depressive episode compared to 1.33 times for women (Hoebel et al., 2017), therefore there is some variability by gender. In addition, women only samples consistently found a significant association over and above objective measures of social position (Dennis et al., 2012; Dolbier et al., 2013; Michelson et al., 2016). There was some indication this was more pronounced within the SSS-community context (Michelson et al., 2016), although a prospective study indicated that SSS-USA predicted post-partum depression at 6 months (Dolbier et al., 2013). Overall, the relationship between SSS and depressive symptoms held for both men and women, although indicated some variability across studies.

In samples of Asian-Americans, two studies found significant associations between SSS and depressive symptoms controlling for factors such as demographics, however with the inclusion of more psychologically-oriented variables, such as perceived discrimination and acculturative stress, the relationship did not hold (Lau et al., 2013; John et al., 2012). This may also indicate potential mechanisms for the relationship between SSS and depressive symptoms, as immigration factors such

as discrimination may be pertinent. In samples of Latinos living in the USA the influence of psychological factors were further highlighted in a series of analyses that found significant interactions between SSS and anxiety sensitivity (Lau et al., 2013; Zvolensky et al., 2015), rumination (Talavera et al., 2017), emotional dysregulation (Zvolensky et al., 2017a) and mindfulness (Zvolensky et al., 2018). Additionally, an experimental study found an induced low SSS group had significantly higher rumination after adjusting for depressive symptoms (Schubert et al., 2016). These findings suggest psychological factors may moderate or mediate the relationship between SSS and depressive symptoms. Notably, the relationship between SSS and depressive symptoms did not always weaken when co-varying for psychological variables, including anxiety sensitivity (Reitzel et al., 2016) and acculturation, stress and discrimination (Jagers and MacNeil, 2015), although these studies low quality scores may reduce the validity of their findings. Additionally, SEM studies, explored in the next section, suggest that SSS itself acts as a psychosocial mechanism for SES factors to influence depressive symptoms (e.g., McGovern and Nazroo, 2015).

With regard to social status mobility (i.e., perceiving a change in SSS), two studies compared the current status of Latino immigrants in the USA with their country-of-origin status; perceiving a drop of three rungs or more in the SSS ladder was associated with a depressive episode in the past year (Nicklett and Burgard, 2009) and those perceiving downward mobility were 2.9 times more likely to have experienced a depressive episode in the past year (Alcantara et al., 2014). Among samples of both rural and urban Chinese people, perceiving downward intra-generational mobility (current status vs. status 10 years ago) was associated with depressive symptoms for both urban and rural people, and downward inter-generational mobility (current status vs. family's status when 14 years old) was significant for the rural sample (Jin and Tam, 2016). Therefore, perceiving a reduction in social status is associated depressive symptoms across different samples.

#### *3.4.2.1 Suicide ideation and SSS multivariate findings*

Three studies had suicidal ideation as the outcome in their multivariate analyses, finding that the relationship between SSS and suicidal ideation was significant when controlling for demographic variables (e.g., marital status, age, employment) in samples of young Kenyan men (Goodman et al., 2017) and low income Latino's (Zvolensky et al., 2016). As the relationship was not significant for a non-low income Latino group (Zvolensky et al., 2017a), the impact of low SSS upon suicidal ideation may be more pronounced in low income samples. Again, when psychological variables such as loneliness and self-esteem (Goodman et al., 2017), and negative affect (Zvolensky et al., 2016) are added, the association is weakened to be non-significant.

### *3.4.3 Multivariate findings for other measures of social rank*

Five (83%) of the papers using other measures of social rank (Table 3) included a multivariate analysis; three simple regression models, one SEM and one ANOVA. Overall, the direction of the relationship (i.e., higher social rank = lower depression) remained consistent with the univariate findings. All three simple regression analyses indicated a significant relationship between lower social rank and depressive symptoms (Chou and Chi, 2001; Swallow and Kuiper, 1987; Thwaites and Dagnan, 2004). Although in one study it is unclear if the relationship between the social comparison and interest scale (SCIS) and depressive symptoms remains when including measures of the importance of comparison dimensions (e.g., intelligence, social skills) to themselves and others, as the authors did not report the relative contribution of each variable (Thwaites and Dagnan, 2004).

Further, the main effect of a similarity to others ranking was significantly related to depressive symptoms when controlling for dysfunctional attitudes, suggesting that as similarity ratings increased levels of depression decreased (Swallow and Kuiper, 1987). Finally, lower social comparisons with people of a similar age on various dimensions (finances, friend support, relationship with children) were related to higher depressive symptoms controlling for demographic factors such as age and education (Chou and Chi, 2001). Therefore, there is some evidence that the relationship remains when other factors, in particular demographics, are controlled for.

#### *3.4.4 Summary of the prospective findings of social rank and depressive symptoms*

Although the vast majority of studies were cross-sectional, social rank was tested as a predictor of depressive symptoms over time in four good to excellent quality studies (Feinstein et al., 2013; Sturman & Mongrain, 2008; McGovern and Nazroo, 2015; Dolbier et al., 2013). There was evidence of a prospective relationship in two a student samples, with Facebook SCS predicting depressive symptoms over a relatively short 3 week period (Feinstien et al., 2013), and a combination SCS and entrapment variable predicting a major depressive episode over 16 months over and above past episodes and current depressive symptoms (Sturman & Mongrain, 2008). In a sample of post-pregnant women, SSS predicted post-partum depression at 6 month follow-up (Dolbier et al., 2013) and in path analysis with older adults there was evidence that SSS directly impacted depressive symptoms at 8-9 year follow-up (McGovern and Nazroo, 2015). Therefore the prospective relationship between social rank and depressive symptoms spans different samples and follow-up time periods. However, as none of the prospective studies tested depressive symptoms as a predictor of social rank, it is not possible to refute the potential bi-directionality of the relationship.

### **3.5 Investigating evidence for mediators or moderators of the social rank and depressive symptoms relationship**

#### *3.5.1 SCS mediation and moderation findings*

The multivariate findings highlighted potential mechanisms for the relationship between SCS and depressive symptoms; including self-persecution (Gilbert et al., 2010), survivor guilt, defeat and entrapment (Carvalho et al., 2013; Gilbert et al., 2002; Wyatt and Gilbert, 1998). Six studies undertook a mediation or moderation analyses that included SCS and depressive symptoms (Aderka et al., 2013; Dunn et al., 2012; Feinstein et al., 2013; Lup et al., 2015; Sturman and Mongrain, 2005; Weisman et al., 2011). Two studies, in a series of regression analyses for mediation, found an SCS variable acted as a mediator; in one study a combined SCS and entrapment variable mediated the

relationship between self-criticism and past episodes of depression (Sturman and Mongrain, 2005) and in the other Instagram SCS was a moderated mediator of Instagram use and depressive symptoms (number of Instagram followers moderated; Lup et al, 2015). This indicates that SCS itself may act as a mechanism for other factors (self-criticism and Instagram use) to influence depressive symptoms, although as these analyses are cross-sectional it is not possible to be conclusive. Again highlighting potential bi-directionality, an SEM analysis based upon the *social risk hypothesis*, found SCS was an antecedent to depressive symptoms, with depressive symptoms mediating the relationship of SCS to inhibitors of social risk-taking (interpersonal sensitivity and submissive behaviour), although gender and self-esteem did not moderate this relationship (Dunn et al., 2012) . Therefore, when placed within a different framework, depressive symptoms may also mediate the relationship of SCS with other psychological variables.

In two SEM studies social anxiety symptoms mediated the relationship between SCS and depressive symptoms, and this was found in both a general population sample that included submissive behaviour and attachment as precursors of social anxiety in their analysis (Aderka et al., 2009), and in a clinical sample that included submissive behaviour, attachment and avoidance (Weisman et al., 2011). These findings, replicated in two samples, indicate that feeling socially anxious may be a mechanism whereby perceiving yourself as having a lower social standing can lead to depressive symptoms. Additionally, in a highly rated paper, a prospective path analysis found the relationship between Facebook SCS and depressive symptom three weeks later was mediated by rumination, and interestingly this finding was not replicated with a measure tapping comparison tendency rather than rank (Feinstein et al., 2013). Therefore rumination may be an important mechanism whereby comparing negatively with others, in this case on Facebook, may lead to depressive symptoms (Feinstein et al., 2013). As noted before, defeat and entrapment may also be important mechanisms for this relationship (e.g., Carvalho et al., 2013), although this was not formally tested.

### 3.5.2 Suicide ideation and SSS mediation and moderation findings

Generally, the multivariate findings indicated that the relationship between SSS and depressive symptoms remained significant whenever SES and demographic variables were controlled for, but weakened with the inclusion of psychological variables. This suggests that SSS may act as a psychosocial mechanism for SES variables to impact depressive symptoms (e.g., Demakakos et al., 2008), and there may also be further psychological factors mediating the relationship between SSS and depressive symptoms (e.g., John et al., 2012). Of the SSS papers, 11 completed some form of formal mediation or moderation testing (Cundiff et al., 2011; Goodman et al., 2015; Hoebel et al., 2015; Jagers and MacNeil, 2015; Lau et al., 2013; McGovern and Nazroo, 2015; Reitzel et al., 2016; Talavera et al., 2017; Zvolensky et al., 2015; Zvolensky et al., 2017; Zvolensky et al., 2018). In line with SSS acting as a psychosocial mechanism, SSS was found to mediate the relationship between a composite index of objective SES (i.e., occupation, income) and depressive symptoms for both men and women (Hoebel et al., 2015). As that finding was cross-sectional causality cannot be assumed, however, in prospective path analysis much of the effects upon depressive symptoms of the major socio-economic indicators of class and wealth worked through SSS, and cultural factors that may be related to status (e.g., theatre going) were more related to SSS than depressive symptoms directly (McGovern and Nazroo, 2015). Therefore SSS may be an important psychosocial mechanism whereby SES factors influence subsequent depressive symptoms.

With immigrant-related factors, one study found no evidence that SSS mediated the relationship between acculturation and depressive symptoms for Latino's living in the USA (Jagers and MacNeil, 2015). A study with Asian-American women found perceiving higher SSS-community had a suppression effect on the influence of where they were born upon depressive symptoms, specifically US-born women perceived a higher community social standing compared to immigrant women, and therefore less depressive symptoms (Lau et al., 2013). Additionally, two studies with Latino samples found SSS moderated the relationship between rumination and mindfulness upon depressive symptoms, with the association between these factors and depressive symptoms being stronger when SSS is lower (Talavera et al., 2017; Zvolensky et al., 2018). This indicates that rather than acting

as a mechanism, perceiving a low social rank may increase the influence of some psychological factors upon depressive symptoms. Indeed, a further two studies investigated the interaction between anxiety sensitivity and SSS, with one finding lower SSS more strongly associated with depressive symptoms among those with higher anxiety sensitivity in a sample of Latinos (Zvolensky et al., 2015), although this was not replicated in a sample of Black Americans (Reitzel et al., 2016). This also suggests that particular psychological factors increased the influence of SSS upon depressive symptoms, although this may vary across samples.

A number of studies found psychological variables mediated the SSS to depressive symptoms or suicidal ideation relationship (Cundiff et al., 2011; Goodman et al., 2015; Zvolensky et al., 2016; Zvolensky et al., 2017). In a sample of older married couples, interpersonal processes (e.g., husband or wives affiliation) as rated by their spouse, partially mediated the relationship between SSS and their partner's depressive symptoms; for wives this was their own controlling behaviour and their husband's affiliation to them, and for husbands their own and their wife's affiliation to them (Cundiff et al., 2011). Another study with low income Latino's found higher emotional dysregulation partially mediated the relationship between SSS and depressive symptoms, as well as fully mediating the association between SSS and suicidal ideation, suggesting in particular that lower status Latinos respond to acculturative stress with less emotional clarity (Zvolensky et al., 2017). A further two studies also found mediators of the relationship between SSS and suicidal ideation. With a Latino sample a measure of negative affect mediated the relationship (Zvolensky et al., 2016), indicating that mood may be an important mechanism. Additionally, with Kenyan men loneliness and collective self-esteem partially mediated, and when low hope and meaning in life were added (as mediators of the loneliness and self-esteem relationship with suicidal ideation) the direct effect of SSS upon suicidal ideation was no longer significant, indicating multiple mediation of these variables (Goodman et al., 2015). Therefore these are examples of psychological processes that may act as mechanisms of the relationship of SSS with both depressive symptoms and suicidal ideation.



### *3.5.3 Other social rank mediation and moderation findings*

Most of the remaining papers explored some form of mediation or moderation in their analysis (Antony et al., 2005; Chou and Chi, 2001; Qiu et al., 2011; Swallow and Kuiper, 1987; Thwaites and Dagnan, 2004). Similar to some of the SSS findings (e.g., McGovern and Nazroo, 2012), self-rated economic status (SRES) acted as a mediator of SES (i.e., income, education) upon depressive symptoms, whereby SRES was proximally related and the SES factors were distal (Qiu et al., 2011). This lends support to the idea that feeling of lower rank may be a mechanism whereby SES factors such as income or class may influence mental wellbeing. Further, among older adults in Hong Kong, social comparison with people of a similar age on their financial situation and levels of support from friends both acted as mediators of the relationship between actual financial strain and support with depressive symptoms, with self-efficacy and self-esteem moderating the relationship (Chou and Chi, 2001). Therefore, similar to the findings with SES factors, how we perceive our life circumstances compared to others may influence negative outcomes such as depressive symptoms, and factors such as self-esteem may buffer this.

A number of other potential moderators emerged; perceiving a higher importance of the comparison dimensions (e.g., intelligence, social skills) moderated the social comparison and interest scale (SCIS) relationship with depressive symptoms by increasing risk (Thwaites and Dagnan, 2004), and those with higher dysfunctional attitudes showed a decrease in similarity comparison ratings as depressive symptoms increased (Swallow and Kuiper, 1987). Finally, within an ANOVA, there was some indication gender and education may moderate, as after making a social rank judgement feelings of depression increased more for men in a social phobia sample, and increased less for those who were more highly educated in the non-phobia control sample. Therefore a number of factors may act to influence the relationship between social rank and depressive symptoms, including attitudes and demographic factors.

## **4. Discussion**

The review has addressed its aim to investigate the main premise of the social rank theory of depression (SRT; Price, 1972), by exploring i) the nature and extent of the relationship between social rank variables and depressive symptoms, and ii) evidence for any mediators or moderators of the social rank and depressive symptoms relationship. Consistent with the theory of social rank (Price and Sloman, 1987), the current review has demonstrated that perceiving oneself as having lower rank compared to others is consistently linked to higher depressive symptoms, particularly in univariate analysis. It also provided more limited evidence that perceived low rank is associated with suicidal ideation and self-harm. When other factors were accounted for in multivariate analyses a more complex picture emerged; overall the relationship between social rank and depressive symptoms appeared more robust within non-clinical populations and when SES-related variables were accounted for rather than psychological factors.

It is proposed that when other psychological variables are accounted for, the strength of the relationship between social rank and depressive symptom is reduced. This may be more evident in clinical groups as these factors are more commonly elevated, therefore explaining more of the variance in depressive symptom scores. Indeed, factors such as self-criticism and shame are important in the understanding of how perceptions of social rank may become maladaptive from an evolutionary perspective (Gilbert and Irons, 2008). Additionally, although markers of SES are consistently associated with depressive symptoms (e.g., Lynch et al., 2000), measures of social rank may have a stronger association as they tap more psychosocial constructs than the objective indicators (Marmot and Wilkinson, 2001). Importantly, the inclusion of psychological variables highlights the potential pathways whereby social rank may impact upon depressive symptoms, or indeed be a mechanism itself, as may well be the case with the relationship between markers of SES (e.g., income, education) and depressive symptoms (Wilkinson and Pickett, 2006).

The formal mediation analyses highlighted potential mechanisms to explain the relationship between social rank and depressive symptoms; these included social anxiety, rumination,

interpersonal processes and emotional dysregulation. Additionally, for the relationship of social rank and suicidal ideation, negative affect and a combination of low self-esteem, hope and meaning in life with loneliness were also mediators. The key constructs of defeat and entrapment were not tested as mediators, although there was consistent evidence that they may be important (e.g., Carvalho et al., 2013; Gilbert et al., 2002; Wyatt and Gilbert, 1998). This supports the SRT, as well as prominent models of suicidal behaviour, in particular the integrated motivational-volitional model (IMV; O'Connor, 2011). This model proposes that defeat and entrapment are key to understanding the emergence of suicidal ideations, and perceptions of a lower rank may increase feelings of defeat, in turn leading to entrapment and thoughts of suicide (O'Connor and Kirtley, 2018).

In acting as a mediator, perceiving lower social rank appears to be an important mechanism in the relationship between SES factors and depressive symptoms (e.g., McGovern et al., 2010; Qiu et al., 2011), as well as being a mechanism for factors such as self-criticism (Sturman and Mongrain, 2005) and Instagram use to influence depressive symptoms (Lup et al., 2015). Indeed, perceiving higher social rank also had a suppression effect, whereby the impact of place of birth (USA vs. immigrant) upon depressive symptoms was lower, with higher SSS being a protective mechanism (Lau et al., 2013). Therefore, feeling of a lower social rank or standing compared to others may be the psychosocial mechanism whereby certain life circumstances are translated into negative outcomes such as depressive symptoms. There was also some evidence that a perceived fall in social rank was related to higher depressive symptoms (Jin and Tam, 2015; Alcantara et al., 2014; Brewer and Olive, 2014; Nicklett and Burgard, 2009), therefore perceiving oneself to have lost status may consequently add to a sense of failure or defeat. This is consistent with the main premise of the SRT, which suggests that an involuntary defeat mechanism (IDS; Sloman, 2000) is activated in situations when an individual is lower on the social hierarchy, usually in the competition for resources from an evolutionary perspective. Although, as evidenced by the inclusion of social media contexts, the arena of comparison may have changed in modern society (Feinstein et al., 2013; Lup et al., 2015). Specifically, social media may create new environments for feelings of inferiority and self-criticism to

emerge, as individuals have an ever present need to be accepted and to fit-in with others. This in turn creates more need to compete to avoid inferiority, with defeating situations that do not involve social aspects, and therefore the threat of rejection, appearing to not have the same harmful effects (Gilbert et al., 2007b).

With regard to moderators, a number of factors were identified that interacted with social rank (or social rank interacted with them) to influence depressive symptoms; lower social rank was found to increase risk as it interacted with rumination (Talavera et al., 2017), mindfulness (Zvolensky et al., 2018), dysfunctional attitudes (Swallow and Kuiper, 1987) and the importance of the area of comparison (Thwaites and Dagnan, 2004). Across these studies, social rank was both the moderator and the variable influenced by a moderator, therefore highlighting some uncertainty in the direction of the relationships. Indeed, the vast majority of the studies were cross-sectional and establishing the direction is therefore not possible, although there was some evidence of social rank predicting depressive symptoms over time (McGovern and Nazroo, 2015; Feinstein et al., 2013; Dolbier et al., 2013). Indeed a small number of cross-sectional studies placed the social rank variable as the outcome in their analysis (Dunn et al., 2012; Garbarski, 2010; Sturman and Mongrain, 2005) and another found depressive symptoms affecting SSS to be the best fitting SEM model (Garbarski, 2010), indicating that the relationship can be framed both ways. Therefore, there may be a bi-directional or reciprocal relationship between perceptions of social rank and depressive symptoms, with further prospective research is required to better establish how these pathways function. It may be that the internalisation of depressive symptoms perpetuates the *arrested flight* aspect of the social defeat situation, thereby increasing the feeling of entrapment and inescapability (Dixon, 1998).

The relatively low study quality (as evidenced by the scoring of the quality assessments), particularly with the papers using the social comparison scale and other measures of social rank, indicates that more rigorous research is required to firmly establish not only the direction of the relationship, but

the mechanisms and factors that may change, or buffer, the relationship between social rank and depressive symptoms. The papers with the highest quality ratings were prospective studies, one finding social rank itself to be a potential mechanism for SES factors to influence depressive symptoms over an 8 year follow-up (McGovern and Nazroo, 2015), and the other that rumination mediated the relationship of social comparison on Facebook with depressive symptoms over time (Feinstein et al., 2013). These findings highlight the potential usefulness of understanding an individual's perception of their social rank, as it may be an important mechanism for life circumstances to impact mental wellbeing, possibly through the manifesting of negative psychological symptoms such as rumination. The internalising of a social defeat or humiliation (face-to-face or via social media) through rumination may be a catalyst for perceptions of social rank to influence our mental wellbeing; as humans we can replay the defeat, becoming self-critical and shameful about what others think of us (Gilbert, 2001). There is evidence, mainly from the animal literature, that this is aggravated by a lack social support and isolation (Gilbert et al., 1995b; Ruis et al., 2001).

The review findings have considerable clinical relevance, in particular in respect of our understanding of the aetiology of depressive symptoms, and how an individual's place within the social world may be associated with psychopathology. As noted, depressive symptoms may be adaptive evolutionary defences that emerge in response to different life events or defeating situations, and there is evidence that particular adverse life events are related to specific symptom profiles, for example failures (a possible consequence of low rank) were associated with fatigue and hypersomnia (Keller et al., 2007). Indeed, a study included here indicated that submissive behaviour may be an outcome of social rank's influence upon depressive symptoms (Dunn et al., 2012), and therefore it would be useful from a clinical point of view to understand how individuals perceive their status as this may lead to a better understanding of their particular depressive symptomology. A recent network analysis of a range of depressive symptoms indicated that some symptoms are

more central to the depressive symptom network, such as energy loss and sad mood, and therefore a more 'symptoms-based approach' may be more useful in treating depression (Fried et al., 2016).

#### *4.1 Limitations*

The findings of this review should be interpreted within the context of its limitations, some of which have already been highlighted. Namely, the relatively low quality scoring and the predominantly cross-sectional nature of the majority of studies indicate that we need more robustly designed research to fully realise the nature of the relationship between social rank and depressive symptoms, and in particular self-harm and suicidal thoughts. Indeed, none of the studies investigated suicide attempts explicitly, with only three studies investigating self-harm. Additionally, there was risk of publication bias as only published research was included. It should also be noted that the quality assessment tool, although based on previous studies, was amended and therefore may not have included all possible criteria for assessing quality. Additionally, the heterogeneity of the measures of social rank and the populations sampled rendered a meta-analysis not suitable. Finally, the studies were predominantly from either the UK or USA, which limits the cultural generalisability of the findings, although the studies from China and Kenya show similar results (Goodman et al., 2001; Jin and Tam, 2015). Also, although different demographics were represented across the research (e.g., pregnant women, older adults), more could be done to explore how social rank changes as a function of demographic differences.

#### *4.2 Conclusions*

In summary, this systematic review found a negative relationship between measures of social rank and depressive symptoms, whereby perceiving a higher social rank was associated with fewer depressive symptoms. There was some evidence this relationship is stronger in clinical samples, and remained after the inclusion of SES measures, but it was often weakened when psychological measures were included. Where reported, formal tests of mediation and moderation concurred with

this finding; whereby in some circumstances the social rank measure mediated the relationship of factors (in particular SES variables) with depressive symptoms (or suicidal ideation), and that psychologically based variables then mediated or moderated the relationship of social rank with depressive symptoms (e.g., rumination, anxiety sensitivity, emotional dysregulation). These may be indicators of an evolutionary adaptive mechanism becoming maladaptive. Although this review presents a relatively complex picture, it ultimately highlights the importance of understanding an individual's perception of their social position compared to others as it may lead to an enhanced understanding of the aetiology of depression. However, more prospective research is required to better understand how this may change over time and explore the directionality of the relationship.

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**Figure 1: PRISMA Chart of the search screening for the relationship of social rank with depression and/or suicidal ideation or self-harm**

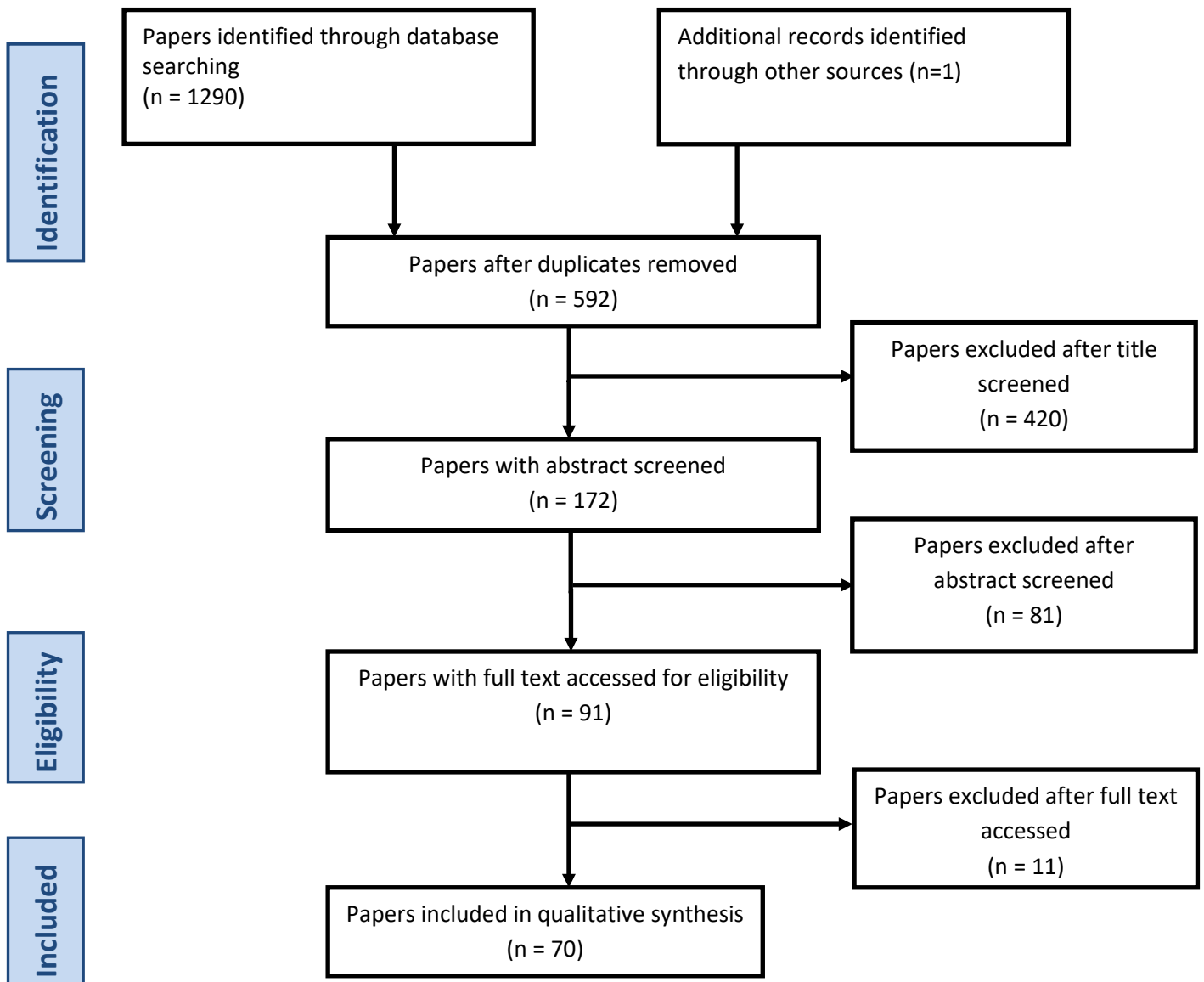


Table 1: Overview of papers investigating the Social Comparison Scale (SCS) with depressive symptoms and suicidal ideation/ behaviour or self-harm (n=32)

Author (year) & country	Design & Quality Assessment	Sample; n, mean age & % female & % largest ethnicity	Measures (depressive symptoms; social rank)	Univariate findings (Pearson's r correlations)	Multivariate findings
Aderka et al. (2009), Israel	Cross-sectional, 5	Community; n= 102, F= 70.6%, Mage= 29.5 yrs, ethnicity n/r	BDI; 11-item SCS	r= -0.32.	SEM: social anxiety mediated the SCS to depressive symptoms relationship.
Allan & Gilbert (2002), UK	Cross-sectional, 4	Students; n= 197, F= 62.9%, Mage= 23.4 years, ethnicity n/r	CES-D; 11-item SCS	r= -0.44.	None relevant.
Allan & Gilbert (1995), UK	Cross-sectional, 4	Students; n=180, F=91.1%, Mage= 23.4 years. Clinical (non-psychotic day patients); n= 32, F= 50%, Mage= 38.9 years, ethnicity n/r	SCL-90-R (depression subscale); 11-item SCS	Student group, r= -0.28; Clinical group, r= -.39.	None relevant.
Brewer & Olive (2014), UK	Cross-sectional, 6	Community; n= 217, F= 71%, Mage= 23.7 years, ethnicity n/r	CES-D; 11-item SCS	Relative rank change; men r= -0.47; women r= -0.57. Desired rank change; men r= 0.64, women r= 0.66.	Hierarchical regression: Relative rank change (i.e., current minus previous rank) was associated with depressive symptoms, controlling for anxiety and interpersonal dependency for both men and women.
Carvalho et al. (2013), Portugal	Case control, 8	General population; n= 116, F= 75%, Mage= 35.9 years. Depressed patients (MDE diagnosis); n= 106, F= 73.6%, Mage= 37.9 years, ethnicity n/r	SCID-I; 11-item SCS	Clinical r= - 0.60, Controls r= - 0.33. Significant difference on SCS scores for clinical (M = 54.78) and non-clinical (M = 70.25).	Logistic regression: SCS and submissive behaviour not significantly associated with belonging to depressed group, internal entrapment and defeat were.

Cheung et al. (2004), UK	Cross-sectional, 5	Students; n= 125, F= 55.2%, Mage= 22.4 years, ethnicity n/r	CES-D; 11-item SCS	r= -0.38.	None relevant.
Cruddas, et al, (2012), UK	Cross-sectional, 4	Students; n= 92, F= 87%, Mage= 24.26 years, ethnicity n/r	DASS21; 11-item SCS	r= -0.52.	None relevant.
Dunn et al., (2012), Canada	Cross-sectional, 6	General population; n= 397, F= 68.2%, Mage= 45.9 years, Caucasian= 89.3%	DASS21 (2 subscales); 11-item SCS (SCS subscales: Rank, Group fit and Attractiveness)	DASS21 subscale 1; Rank r= -0.41, Group fit r= -0.37, Attractiveness r= -0.37. DASS21 subscale 2; Rank r= -0.41, Group fit r= -0.38, Attractiveness r= -0.34.	SEM: the relationship of SCS with both interpersonal sensitivity and submissive behaviour was mediated by depressive symptoms. Gender and self-esteem did not moderate.
Feinstein et al. (2013), USA	Prospective (3 weeks), 9	Students; n= 268, Mage= 19.7 years, F= 62%, Asian= 42%	CES-D; Facebook 11-item SCS (reverse scored)	T1 depressive symptoms, r= 0.38, T2 depressive symptoms; r= 0.35.	Path analysis: relationship of Facebook SCS with T2 depressive symptoms mediated by T2 rumination (indirect effect of T2 rumination significant).
Gilbert & Allan (1998), UK	Cross-sectional, 6	Students; n= 302, F= 77.2%, Mage= 22.9 years. Clinical (depressed patients), n= 90, F= 53.3%, Mage= 40.8 years, ethnicity n/r	Students= CES-D, depressed group= BDI; 11-item SCS	Students r= - 0.43, depressed group r= - 0.65.	Hierarchical regression: for both student and depressed groups, the proportion of variance accounted for by SCS and submissive behaviour on depressive symptoms was significant. Addition of defeat and entrapment significantly increased variance accounted for. Unclear if SCS remained significantly associated.
Gilbert et al. (1996), UK	Cross-sectional, 4	Students; n= 80, F= 77.5%, Mage= 25 years, ethnicity n/r	CES-; 11-item SCS	r= - 0.47	None relevant.
Gilbert et al. (2002), UK	Cross-sectional, 6	Students, n= 193, F= 76.7%, Mage= 22.9 years. Clinical (psychiatric in-patients), n= 81, F= 60.5%, Mage= 36.8 years, ethnicity n/r	MASQ short-form: Depressive Symptoms (GDD) and Anhedonic Depression (AD), 11-item SCS	Students; GDD r= - 0.46, AD r= - 0.44. Clinical; GDD r= - 0.70, AD r= - 0.72. Combined; AD r= -0.68.	SEM: SCS narrowly failed to show a statistically significant differential impact on anhedonic depression (defeat, but not entrapment, did have a specific impact).
Gilbert et al. (2003), UK	Cross-sectional, 4	Students; n= 102, F= 76%, Mage= 27.06 years, ethnicity n/r	CES-D; 11-item SCS	r= - 0.44	None relevant.

Gilbert et al. (2006), UK	Cross-sectional, 4	Clinical (depressed patients); n= 104, F= 48.1%, Mage= 39.28, ethnicity n/r	MASQ short-form: Depressive Symptoms (GDD) and Anhedonic Depression (AD), 11-item SCS	GDD, r= - 0.52; AD, r= - 0.48	Principal components analysis: SCS loaded, along with rejection sensitivity and submissive behaviour, onto an 'internalisation' factor that was significantly related to depressive symptoms.
Gilbert et al. (2007a), UK	Cross-sectional, 5	Clinical (bipolar patients in remission); n= 40, F= 52.5%, Mage= 49.2 years, ethnicity n/r	BDI & ISS-DI; 11-item SCS	BDI, r= - 0.45; ISS-DI, r= - 0.31	Multiple regression: for both BDI & ISS-DI, variables (SCS, submissive behaviour, 3 attachment measures) accounted for a significant proportion of variance, no significant contribution of any one variable.
Gilbert (2000), UK	Cross-sectional, 4	Students; n= 109, F= 88.1%, Mage= 25 years. Clinical (depressed patients); n= 50, F= 52%, Mage= 39 years, ethnicity n/r	Students= CES-D, Depressed group= BDI; 11-item SCS	Students, r= - 0.40; Clinical r= - 0.33	Hierarchical regression: for students SCS made significant contribution to variance when social rank (vs. shame) variables entered first. For clinical group SCS not associated with depressive symptoms when other (social rank and shame) variables included.
Gilbert & Miles (2000), UK	Cross-sectional, 4	Students; n= 155, F= 79.4%, Mage= 24 years, ethnicity n/r	CES-D; 11-item SCS	r= - 0.47	Principal components analysis: SCS loaded onto a factor with depression, shame, hostility and guilt (interpreted as internalised factors).
Gilbert et al. (1995), UK	Cross-sectional, 4	Students; n= 80, F= 72.0%, Mage= 26 years. Clinical (depressed patients), n= 29, F= 79.3%, age= 38 years, ethnicity n/r	BDI, 5-item SCS (early version)	Students, r= - 0.38; Clinical, r= - 0.66.	Hierarchical regression (backward elimination): with students removal of SCS from regression did not significantly change variance explained, for clinical group removal of SCS significantly reduced variance explained (other variables were submissive behaviour, attachment and approval).
Gilbert et al. (2007b), UK	Cross-sectional, 6	Students; n= 207, F= 84.1%, Mage= 21.8 years, ethnicity n/r	DASS21 (depression subscale); 11-item SCS	r= - 0.47	Multiple regression: SCS significantly associated with depressive symptoms, along with submissive behaviour, insecure striving and secure non-striving, hypercompetitive attitudes were not.
Lup et al. (2015), USA	Cross-sectional, 4	Community; n= 117, F= 83.8%, Mage= 24.8 years, White/European American= 83%	CES-D; 4-item Instagram SCS	r= - 0.22	Mediation analysis: Main effect of SCS significantly associated with depressive symptoms. Strangers followed moderated the association of Instagram use with SCS. Some support for moderated mediation; indirect effect of instagram use on

					depressive symptoms through social comparison was moderated by number of strangers followed.
Matos et al. (2012), Portugal	Cross-sectional, 5	Students; n= 385, F= 87.8%, Mage= 22.8 years, ethnicity n/r	DASS42 (depression subscale); 11-item SCS (both Portuguese translations)	r= - 0.41	None relevant.
McEwan et al. (2012), Study 1, UK	Cross-sectional, 5	Students; n= 312, F= 68.9%, Mage= 20.25 years, ethnicity n/r	DASS21 (depression subscale); 11-item SCS	r= - 0.36	Multiple regression: no variable significantly associated with depression, although unclear if SCS included. Gender potential moderator as men scored significantly higher on SCS than women (i.e., made more positive comparisons than women)
McEwan et al. (2012) Study 2, UK	Cross-sectional, 4	Clinical (depressed patients); n= 48, F= 70.0 %, Mage= 48.68 years, ethnicity n/r	DASS21 (depression subscale); 11-item SCS	r= - 0.47	Multiple regression: unclear of social comparison included, only competitiveness was significantly associated with depressive symptoms. SCS not included in mediation analysis.
O'Connor et al. (2002), USA	Cross-sectional, 6	Students; n= 52, F= 65.4%, age= 20.2 years. Clinical (depressed inpatients); n= 50, F= 40.0%, Mage= 39.2 years, Caucasian= 100%	BDI; 11-item SCS	r= - 0.80	Multiple regression: for students SCS was significantly associated with depressive symptoms, controlling for survivor guilt and gender, but for clinical group SCS was not associated. When combined, it was significantly associated.
Sturman & Mongrain (2005), Canada	Cross-sectional, 5	Clinical students (MDE); n= 146, F= 71.9%, median age= 28 years, Caucasian= 82.3%	CES-D; 11-item SCS	r= - 0.48	Multiple regression: with SCS as the outcome, depressive symptoms and self-criticism were significantly associated with SCS, dependency was not. SEM analysis: a combined variable of SCS and entrapment mediated the effect of self-criticism on the number of past episodes of depression.
Sturman & Mongrain (2008), Canada	Prospective (16 months), 7	Clinical students (MDE); baseline n= 146, F= 71.9%, median Mage= 28 years, Caucasian=	SCID (past episodes of MDE); 11-item SCS - combined with entrapment for involuntary	r= - 0.30	Logistic regression: IS factor significantly predicted depression recurrence (16 months), over and above past episodes and current depressive symptoms. Recurrence group lower on baseline IS and SCS.



		82.3%; Follow-up, n= 86 (other n/r)	subordination variable (IS)		
Weeks et al. (2009), Study 2, USA, 5	Cross-sectional, 5	Students; n= 275, F= 70.6%, Mage= 19.6 years, Caucasian= 55.7%	BDI-C; 11-item SCS	r= - 0.46	None relevant.
Weisman et al. (2011), Study 2, Israel	Cross-sectional, 5	Clinical (social anxiety, anxiety and co-morbid MDD); n= 76, F= 44.7%, Mage= 30.7 years, ethnicity n/r	BDI; 11-item SCS	r= - 0.44	SEM: Social anxiety mediated relationship of SCS and depressive symptoms, analysis included submissive behaviour, attachment anxiety and avoidance.
Wyatt & Gilbert (1998), UK	Cross-sectional, 4	Students; n= 113, F= 77.9%, Mage= 24.9 years, ethnicity n/r	CES-D; 11-item SCS	r= -0.48	Stepwise multiple regression: SCS did not make a significant contribution, once defeat entered no other variable significant.
<i>Papers with suicidal ideation/ behaviour or self-harm</i>					
Gilbert et al. (2009), UK	Cross-sectional, 4	Clinical (mixed depressed inpatient & outpatient); n= 62, F= 58.1%, Mage= 44.3 years, ethnicity n/r	DASS21 (depression subscale), SHI; 11-item SCS	Depressive symptoms, r= - 0.45; self-harm, r= - 0.36	None relevant.
Gilbert et al. (2010), UK	Cross-sectional, 5	Clinical (mixed diagnosis); n= 73, F= 60.3%, Mage= 41.3 years, ethnicity n/r	HADS (depression subscale), SHI; 11-item SCS	Depressive symptoms, r= - 0.58; self-harm, r= - 0.34.	Multiple regressions: SCS was not significantly associated with depressive symptoms, although it neared significance. SCS was not significantly associated with self-harm symptoms. Self-persecution was associated with both depressive and self-harm symptoms.
Williams et al. (2009), UK	Cross-sectional, 4	Students; n= 92, F= 81.9%, Mage= 21.05 years, ethnicity n/r	DASS21 (depression subscale), SHI; 11-item SCS	Depressive symptoms, r= - 0.55; SHI, r= -0.28	Multiple regressions: Variables accounted for 45% of variance in depressive symptoms, and 14% of variables in self-harm symptoms. Relative contribution of SCS not reported, competitive insecure striving significantly contributed to variance in both analyses.

*Abbrs:* BDI = Beck Depression Inventory; CES-D = Center for Epidemiologic Studies Depression Scale, SCL-90-R = Symptom Checklist-90-Revised; DASS21 = Depression Anxiety Stress Scales-21; HADS = Hospital anxiety and Depression scale; SCID = Structured Clinical Interview for DSM; MASQ = Mood and Anxiety Symptoms Questionnaire; ISS-DI = Internal State Scale-Depression Index; MDE = Major depressive episode; n/r = not reported, SHI = Self-harm Inventory

Table 2: Overview of papers investigating Subjective Social Status (SSS) with depressive symptoms and suicidal ideation/ behaviour or self-harm (n=32)

Author (year) & country	Design & Quality Assessment	Sample (n); gender & mean age, largest ethnicity %	Measures (depressive symptoms, social rank)	Univariate analysis	Multivariate analysis (including mediation/moderation)
Adler et al., (2008); UK & USA	Cross-sectional, 7	Civil servants (Whitehall-II); n= 6981, F= 66%, age range= 47-67 years, ethnicity n/r; cardio patients (CARDIA), n= 3632, F= 56%, age range= 33- 48 years, Caucasian= 53%	Whitehall: GHQ depression items, SSS-society; CARDIA: CES-D, SSS-USA	Prevalence: Lower SSS score associated with greater prevalence of depressive symptoms among both men and women in both Whitehall II and CARDIA.	Logistic regression (RII): All groups, based on gender, and ethnicity for CARDIA (white and black), showed an independent association of SSS with depressive symptoms, except for Whitehall-II men. Analysis controlled for age and 3xSES variables (education, occupation, income).
Alcantara et al., (2014), USA	Cross-sectional, 6	Latino in USA (NLAAS); n= 1561, F= 48.2%, Mage n/r, 18-34 years= 35.3%, Cuban= 31.3%	WMH-CIDI (past year MDE); SSS-USA & SSS-country-of-origin – change score for <i>perceived mobility</i>	Prevalence rates: neither downward nor upward perceived mobility were associated with MDE.	Logistic regression: adjusting for demographics, SES and ethnicity, Latino immigrants who perceived any downward social mobility had higher odds of a past-year MDE.
Cundiff et al., (2011); USA	Cross-sectional, 6	Older adults; n= 600 (300 couples), F= 50%, Mage= 54.15 years, Caucasian, female= 96.6%, male = 95.8%	CES-D; SSS-community & SSS-USA composite score	Correlations: men r= - 0.37, women r= - 0.35	SEM: SSS directly associated with depressive symptoms for both men and women. Female depressive symptoms partially mediated by their controlling behaviour (rated by husbands) and husband's affiliation (rated by wives). Male depressive symptoms partially mediated by their affiliation (rated by wives) and their wives' affiliation (rated by husbands).

Cundiff et al., (2013): USA	Cross-sectional, 6	Older and middle-aged adults; n= 596, (298 couples); F= 50%, Mage= 54.15 years; Caucasian, female=96.6%, male= 95.8%	CES-D; SSS-USA, SSS-community	Correlations: <i>Middle-aged</i> ; men SSS-US r= - 0.31, SSS-C r= - 0.38, women SSS-US r= - 0.42, SSS-C r= - 0.44. <i>Older</i> ; men SSS-US r= - 0.26, SSS-C r= - 0.23, women SSS-US r= - 0.14, SSS-C r= - 0.17.	Multiple regression: controlling for age, income, SSS-US and SSS-C. SSS-C was significantly associated with depressive symptoms for both men and woman, whereas SSS-USA associated with depressive symptoms for men only.
Demakakos et al., (2008), UK	Cross-sectional, 7	Older adults (ELSA); n= 7433; F= 53.4%; Mage= 66 years; ethnicity n/r	CES-D8 (4 item cut-off); SSS-society	Prevalence (age-adjusted): lower SSS significantly associated with higher depressive symptoms for males and females.	Logistic regression: SSS significantly associated with depressive symptoms for men and women; adjusting for age, marital status, education, class, wealth. SSS may mediate the relationship of education and occupational class with depressive symptoms in men, mediation not formally tested.
Dennis et al., (2012), USA	Prospective (analysis reported cross-sectional), 7	Pregnant women; n= 1322, F= 100%, Mage= 23.9 years, Black= 70.6%	CES-D; SSS-society	Prevalence: women in the lowest compared to highest SSS group reported significantly higher depressive symptoms.	Logistic Regression: Adjusting for SES variables (e.g., education, income) women in the low SSS category were 1.95 times more likely than women in the high SSS category to report depressive symptoms.
Dolbier et al., (2013), USA	Prospective (6 months), 8	Post pregnant women; n= 299, F= 100%, Mage= 23.6 years, African American= 69 %	EPDS (minor-major and major PPD); SSS-USA	None reported	Logistic Regression: adjusting for marital status, poverty, education and race: SSS predicted minor-major PPD at 6 months, but not at 1 month. SSS predicted major PPD at 6 month, but not at 1 month.
Fleuriet et al., (2014), USA	Cross-sectional, 6	Mexican-born immigrant (MI) and Mexican-American (MA) pregnant women; n= 292, F= 100%, Mage= 29.3 years, Mexican-born= 57.5%	PHQ-9; SSS-community	Correlations: total sample r= -0.19, MI r= -0.10, MA r= -0.26.	None relevant.
Fleuriet, J. & Sunil, T. (2017), USA	Cross-sectional, 5	Mexico-born immigrant (MI) and US-born Mexican-	PHQ-9; SSS-community, SSS-USA	Correlations (significant): SSS-community; MA pregnant (r= -0.23), MA	None relevant.

		American (MA) women (pregnant and non-pregnant), n= 571, MI= 51% , MA= 49%, F= 100%, age range =18 to 35 years (Mage n/r)		no children (r= -0.25) and MI on contraception (r=-0.26). SSS-USA; MA pregnant (r= -0.26), MA children (r=0.17) and MI on contraception (r=-0.27). For MA, having children may be a protective factor.	
Garbarski et al., (2010), USA	Prospective (analysis reported cross-sectional), 7	General population (WLS cohort), n= 5731, F= 53%, Mage n/r, ethnicity n/r	CES-D; SSS-USA and SSS-community	None reported	SEM: In best fitting model current depressive symptoms affected current SSS, controlling for past depressive symptoms, health, success and other SES variables (education, occupation and income). Reciprocal and reverse models did not fit as well.
Habersaata, et al., (2017), Switzerland	Cross-sectional, 4	Police officers; n= 56, F= 16.1%, Mage= 39.46 years, ethnicity n/r (100% French speaking Swiss nationals)	BDI-SF; SSS- country, SSS-community, police and friends	Correlation: depressive symptoms were only correlated with SSS-community (r= .33).	None relevant.
Hamad et al., (2008), South Africa	Cross-sectional, 7	Low income adults; n= 257, F= 52%, Mage n/r, African= 68.6%	CES-D; SSS-country and SSS-community	Univariate linear regression: depressive symptoms associated with SSS-community (b= - 2.02) and SSS-country (b= - 1.09).	Multivariate regression: only SSS-community remained associated with depressive symptoms when controlling for gender, age, race, province, number of people in household. SSS-country was not associated.
Hoebel et al., (2017), Germany	Cross-sectional, 7	General population (GEDA); n= 4,952, F= 66%, Mage= 49.9 years, ethnicity n/r	PHQ-8; SSS-society	Prevalence: lower SSS significantly associated with higher depressive symptoms for males and females (e.g., total sample; low SSS= 18.6% - high SSS= 3.4%).	Logistic regression: Being lower on SSS-society significantly increases risk of depressive symptoms for both men and women when controlling for objective SES measures (e.g., income, education and occupation). SSS mediated the relationship of SES and depressive symptoms.
Jagers & MacNeil (2015), USA	Cross-sectional, 5	Latinos born outside USA; n= 581, F= 54%,	CIDI (MDE), SSS-USA	None reported	Logistic regression: controlling for gender, acculturation, stress, discrimination, ethnic identity and SES factors; SSS significantly related to a

		Mage= 35.67 years, Mexican= 34.9%			diagnosis of major depressive episode in the past 12 months. In recursive regression, SSS not significantly related to depressive symptoms.
Jin & Tam (2015), China	Cross-sectional, 6	China General Social Survey (24years +); n= 10,828; urban n= 6611 (61.1%), F= 53%, Mage= 48 years; rural n= 4217, F= 51%, Mage= 50 years, ethnicity n/r	Frequency of depression in past 4 weeks (1 item); SSS-society, SSS at 14 years and SSS 10 years ago	None reported.	Logistic regression: in both rural and urban areas lower SSS was associated with higher depressive symptom frequency, controlling for SES (age, gender, ethnicity, education, income, occupation), past SSS and perceived SSS mobility. Perceived downward intra-generational mobility (current SSS compared to 10 years ago) associated with depressive frequency for both urban and rural. Downward inter-generational mobility (current SSS compared to 14 years old) associated with depressive frequency in rural only.
John et al., (2012), USA	Cross-sectional, 7	Asian Americans; n= 1530, F= 47%, Mage= 39 years, Chinese= 28%	CIDI (MDE past 12 months); SSS-USA, SSS-community and SSS-country-of-origin	None reported.	Logistic regression: Adjusting for age and gender only, SSS-USA and SSS-community associated with depressive symptoms, whereas country of origin-SSS was not. In further models adjusting for income, class etc., SSS not significantly associated with depressive symptoms.
Lau et al., (2013), USA	Cross-sectional, 7	Asian American women; n= 1,030, F= 100%. US-born n= 185, Mage= 38.3 years; later life immigrants n= 477, Mage= 49.9 years; early immigrants n= 368, Mage= 35 years; Chinese= 28.80%	CIDI (MDE or dysthymia); SSS-USA, SSS-community	Univariate logistic regression, SSS-USA ( $\beta = -0.24$ ) and SSS-community ( $\beta = -0.19$ ) inversely related to risk of depressive disorder	Hierarchical regression: SSS variables added in stage 2 (controlling for age, social factors, income, nativity, family support); SSS-USA sig ass with depressive disorder, whereas SSS-community was not. When controlling for cultural, family and discrimination factors in stage 3, SSS-USA no longer significantly associated. SSS-community had a suppression effect (protective factor) for nativity differences upon depressive symptoms.
McGovern & Nazroo (2015), UK	Prospective (8-9 years), 9	Older adults (ELSA); n= 6241; Mage= 62.78 years, F= n/r, ethnicity n/r	CES-D8 (continuous and dichotomous analysis); SSS-community	None reported	Path Analysis: SSS had a significant direct effect on depressive symptoms, controlling for baseline, with those at the top of ladder experiencing 5% fewer symptoms. Most of the effects of class and wealth were indirectly through SSS, and cultural factors

					(e.g., theatre going) were associated with SSS, with most other predictors having non-significant direct effects.
Michelson et al., (2016), USA	Cross-sectional, 6	Mothers (of 5-year olds); n= 162, F= 100%, Mage= 33.27 years, Black= 54.3%	CES-D; SSS-community and SSS-USA	Univariate regression: Total sample; SSS-USA (b= -1.75) and SSS-community (b= -1.50) significant for total sample. SSS-community significant for Black mothers only (b= -2.00), all other non-significant.	Multiple regression: For total sample, only SSS-community was associated with depressive symptoms when SES variables and SSS-USA included in the analysis. With sample divided by race, SSS-community was only associated with depressive symptoms, over and above the SSS-USA, among Black mothers.
Miyakawa et al., (2012), Sweden	Prospective (analysis reported cross-sectional), 7	Swedish working adults (SLOSH); n= 5023, F= 53%, Mage= 47.4 years, ethnicity n/r	SCL-90 (short-form); SSS-society	Prevalence (age standardization): Lower SSS compared to high was significantly related to higher depressive symptoms, for both males and females.	Logistic regression (RII): in model including just age and life satisfaction, SSS was significantly associated with depressive symptoms for males and females. In all other models (controlling for education, income, occupational grade) SSS was not significantly associated with depressive symptoms.
Nicklett & Burgard (2009), USA	Cross-sectional, 7	Latino's and Asian American immigrants (NLAAS); n= 3056, F= 54%, Mage= 39.84 years, Asian= 50.3%	WHO diagnostic interview (MDE past 12 months); SSS-USA, SSS-country of origin (subtracted for social mobility)	Bivariate comparisons: , SSS in country of origin was associated with MDE in last 12 months (F = 2.61), social mobility was not (F = 0.67)	Logistic regression: In model 2, controlling for SSS, mobility, ethnicity, gender, education and other immigration factors; dropping 3 or more steps was associated with more depressive episodes. Lower SSS-country of origin associated with higher odds of depressive episode.
Reitzel et al., (2016), USA	Cross-sectional, 5	Black American; n= 124, F= 79%, Mage= 49 years, Black= 100%	CES-D; SSS-USA, SSS-community	Correlation: SSS-community r = -0.34, SSS-USA r= -0.39	Hierarchical regression: controlling for demographics and anxiety sensitivity, only SSS-USA was significantly associated with depressive symptoms, SSS-community was not. Interaction of anxiety sensitivity and SSS was not significantly associated for either SSS-USA or SSS-community.
Schubert et al., (2016), Germany	Experimental: induced low vs. high status, 7	Students; n= 72; low status group, n= 36, F= 77.8%, Mage= 22.8 years; high status group, n= 36	PHQ-9, DCS; SSS-Germany: low status – told to compare upward, high status compared downward	Univariate ANOVA: Low status group significantly higher on depressive cognitions and rumination	ANCOVA: After adjusting for baseline depressive symptoms, those in the low status group were significantly higher in depressive cognitions and rumination than the high status group.

		F= 80.6%, Mage= 23.7 years, ethnicity n/r			
Shaked et al., (2016), USA	Cross-sectional, 6	Disadvantaged population (HANDLS study); n= 2077, F= 57%, M= 43%, Mage= 47.9 years, African American= 58%	CESD; SSS-USA	Correlation: r= -0.30	Linear regression: depressive symptoms significantly associated with SSS controlling for race, sex, education, employment, income, neighbourhood satisfaction, self-rated health and interactions of race/sex/education/employment.
Singh-Manoux et al., (2003), UK	Cross-sectional, 6	Civil servants (Whitehall-II); n= 6981, F= 34%, Mage= 55.6 years, ethnicity n/r	GHQ-30 (5+ score cut-off); SSS-society	Correlation: r = -0.22 Prevalence (age-adjusted): lower SSS had a higher prevalence of depression for males and females	Logistic regression (RII): for males; models adjusting for a combination of age, life satisfaction, occupational grade, education and income, SSS was significantly associated with depressive symptoms. For females; models adjusting for age, general life satisfaction and education SSS were significant, whereas adjusting for grade and income SSS was non-significant. In a stepwise regression with SSS as outcome, depressive symptoms removal was non-significant.
Talavera et al., (2017), USA	Cross-sectional, 6	Latin Americans; n= 265, F= 86.4%, Mage= 39.3 years, Mexican American= 60.5%	IDAS-depression subscale; SSS-USA	Correlation: r= -0.26	Multiple regression: controlling for demographics and negative affect, SSS was significantly associated with depressive symptoms. An interaction of rumination and SSS was significant. Simple slopes: association between rumination and depressive symptoms stronger when SSS was lower relative to higher SSS.
Wolff et al., (2010), USA	Cross-sectional, 3	General population; n= 3644, F= 52%, Mage= 48.3 years old, White (non-Hispanic)= 77.1%	Depression in past year (1 item); SSS x 4; American society, same race or ethnicity, neighbours, parents at your age	Correlations: SSS-American-society, rho = -0.18, SSS-same race/ethnicity rho= -0.16, SSS-neighbours rho= -0.13, SSS-parents at your age rho = -0.13.	None relevant.

Zvolensky et al., (2015), USA	Cross-sectional, 5	Latin American; n= 143, F= 85.7%; Mage= 39 years, Mexican/Mexican American= 57.8%	IDAS (general depression subscale); SSS-USA	Correlation: r = -0.34	Hierarchical regression: SSS-USA significantly associated with depressive symptoms, controlling for demographics, mood and anxiety sensitivity. Interaction of anxiety sensitivity and SSS significant. Simple slopes: SSS related to higher depressive symptoms among those with higher anxiety sensitivity.
Zvolensky et al., (2018), USA	Cross-sectional, 6	Latin American; n= 384, F= 86.7%, Mage= 38.9 years, 55.1% = Mexican American	IDAS-depression subscale; SSS-USA	Correlation: r= -0.24	Hierarchical regression: SSS significantly associated with depressive symptoms controlling for demographics, SES variables and mindful attention. Interaction of SSS and mindful attention significant. Simple slopes: association between mindful attention and depressive symptoms was stronger among individuals with lower SSS compared to higher SSS.
<i>Papers with suicidal ideation/ behaviour or self-harm</i>					
Goodman et al., (2017), Kenya	Cross-sectional, 7	Semi-rural young men, n= 532, F = 0%, age=18–34 years (Mage n/r), Kenyan= 100%	MSSI (binary); SSS- society	Prevalence: those with no suicidal ideation (SI) reported significantly higher SSS.	Path analysis: SSS direct effect significant controlling for demographics (e.g., age, assets). In mediation model 1, SSS and suicidal ideation partially mediated by loneliness (17%) and collective self-esteem (30%). In mediation model 2 lower hope and meaning in life mediate loneliness and collective self-esteem to SI, direct effect becomes non-significant.
Zvolensky et al., (2016), USA	Cross-sectional, 7	Latin American with low income; n= 205, F= 85.9%, Mage= 39.2 years, Mexican/ Mexican-American= 59.0%	IDAS-suicide subscale; SSS-USA	Correlations: r= -0.15	Mediation analysis: direct effect of SSS with suicidal ideation significant controlling for demographics (e.g., employment, marital status). Negative affect mediated the relationship of SSS and suicidal ideation. Association between SSS and suicidal ideation non-significant with addition of negative affect, an indirect effect significant.
Zvolensky et al., (2017), USA	Cross-sectional, 7	Latin American; n= 384, F= 86.7%, Mage= 38.9 years, Mexican-American= 55.1%	IDAS-depression subscale, IDAS-suicide subscale; SSS-USA	Correlation: depressive symptoms r= -0.24, suicidal ideation r=-0.08 (non-significant)	Mediation analysis: emotional dysregulation (ED) acted as a partial mediator for SSS with depressive symptoms, and a mediator for SSS with suicidal ideation. ED had a significant indirect effect upon depressive symptoms with the direct effect still



					significant. With suicidal symptoms, there was a significant indirect effect of ED.
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*Abbrevs:* BDI (SF) = Beck Depression Inventory (Short Form); CARDIA = Cardiovascular Risk Study; CES-D(8) = Center for Epidemiologic Studies Depression Scale (8-item); DCS = Depressive Cognition Scale; EPDS = Edinburgh Postnatal Depression Scale; RII = Relative Index of Inequality; ELSA = English Longitudinal Study of Ageing ; GEDA = German Health Update, GHQ = General Health Questionnaire; HANDLS = Healthy Aging in Neighborhoods of Diversity across the Lifespan; IDAS = Inventory of Depression and Anxiety Symptoms; MDE = Major Depressive Episode; MSSI = Modified Scale for Suicide Ideation; NLAAS = National Latino and Asian American Study; OR = Odds Ratio; PHQ-8/9 = 8/9 item Patient Health Questionnaire; PPD = Postpartum Depression; SES = Socio-economic Status; SSS = Subjective Social Status; SSS-C = Community SSS; WHO = World Health Organisation; WLS = Wisconsin Longitudinal Study; WMH-CIDI = World Mental Health Composite International Diagnostic Interview; SLOSH = Swedish Longitudinal Occupational Survey of Health

Table 3: Overview of papers investigating other measures of social rank with depressive symptoms and suicidal ideation/ behaviour or self-harm (n=6)

Author (year) & country	Design	Sample (n); gender & mean age, ethnicity	Measures (depression, social comparison)	Univariate analysis	Multivariate analysis (including mediation/moderation)
Appel et al., (2015), Germany	Experimental, 5	Depressed (n=44) and non-depressed controls (n= 45); total sample, n= 89, F= 85.4%, Mage= 27.5 years, ethnicity n/r	German BDI; 1 item social rank measuring their happiness compared to an attractive and non-attractive Facebook profile	ANOVA: Compared to controls, depressed participants rated both attractive and non-attractive profile owners as happier relative to themselves. Interaction of depressed group and attractiveness of profile was non-significant.	None relevant
Antony et al., (2005), UK	Diary method, 5	Social phobia (SP) and non-clinical (NC): SP group n= 59, F= 59%, Mage= 34 years; NC group, n= 58, F= 83%, Mage= 34 years, ethnicity n/r.	BDI (control variable), depression rating (depressed-happy); participants recorded dimension, direction and effect of social comparison in day to day life.	ANOVA: All participants had increased depression ratings after comparing negatively. Although non-significant, there was a tendency for depressive rating to increase more in SP group than in the NC group.	ANCOVA: difference in SP and NC groups in depressive rating after negative comparison was non-significant when controlling for BDI scores. In NC group, education possible moderator as those higher educated showed less increase depression rating. In SP group men showed higher increase in depression rating, therefore gender may moderate.

Chou and Chi (2001), China	Cross-sectional, 5	Older adults in Hong Kong; n= 411, F= 54.3%, Mage= 71.1 years, ethnicity n/r	CES-D; social rank items x 4, compare to 'most people your age' on physical health, financial situation, friendship, relationship with adult children (physical health domain excluded)	Correlation: only comparing relationship with adult children was non-significant, values not reported	Multiple regression: Social comparison on <i>financial situation</i> acts as a partial mediator in the relationship between financial strain and depressive symptoms, with self-efficacy and self-esteem moderating. Comparison on <i>support from friends</i> mediated relationship of actual support from friends and depressive symptoms, with sense of control, self-efficacy and self-esteem moderating. Although there no direct relationship, a significant interaction of comparison on <i>relationship with adult children</i> and self-efficacy and self-esteem with depression was found.
Qiu et al., (2011), China	Cross-sectional, 5	Internal migrant workers; n= 1180, F= 51%, age range 16-25 years old = 38% (Mage n/r), ethnicity n/r	CES-D; Self-rated economic status (SRES) – rate income higher, lower, equal compared to Chengdu city, hometown and migrant workers	None reported	SEM: SRES negatively related to depressive symptoms. SRES mediated relationship of SES (income, education, expenses) and depressive symptoms, with SRES having a proximal relationship with depressive symptoms and SES distal.
Swallow & Kuiper (1987) Canada	Cross-sectional, 3	Undergraduate students; n= 172, no other demo reported	BDI, 1 item social rank of similarity to others	None reported	Multiple regression: similarity ratings decreased as level of depression increased. Significant interaction of depressive symptoms and dysfunctional attitudes. Vulnerable individuals (high scores on DAS) show a marked decrease in similarity ratings as depressive symptoms increased.
Thwaites and Dagnan (2004), UK	Cross-sectional, 5	Non-clinical; n= 97; clinical (receiving CBT), n= 77; total n= 174, F= 67.8%, Mage= 34.63 years, ethnicity n/r	BDI; Social Comparison and Interest Scale (SCIS), compare to others on 10 dimensions (e.g., intelligence, social skills, attractiveness)	None reported	Multiple regression: SCIS, personal importance of domains and perceived importance for others together significantly contributed to variance of depressive symptoms (individual coefficients not reported). Perceived importance of the dimensions in attracting the interest of others moderated the relationship of SCIS and depressive symptoms, whereas the

					personal importance of the dimensions did not.
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*Abbrevs:* BDI = Beck Depression Inventory; CES-D = Center for Epidemiologic Studies Depression Scale; NC = non-clinical; SCIS = Social Comparison and Interest Scale; SP = Social phobia; SRES = Self-rated economic status