



Leveraging the social network for treatment of social anxiety: Pilot study of a youth-specific digital intervention with a focus on engagement of young men

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ABSTRACT

Objective: The primary objective was to determine the acceptability, feasibility and safety of a novel digital intervention (Entourage) for young people with prominent social anxiety symptoms, with a particular focus on the engagement of young men. The secondary aim was to explore whether the intervention was associated with clinically significant improvements to clinical and social variables known to co-occur with social anxiety.

Method: A multidisciplinary team comprising of mental health clinicians, researchers, young adult fiction writers, a comic artist and young people with a lived experience of social anxiety developed the Entourage platform in collaboration. Entourage combines evidence-based therapeutic techniques for social anxiety with an engaging, social-media-based interface that allows users to build social connections, while also receiving expert clinical moderation and support from peer workers. Acceptability, feasibility and safety outcomes of Entourage were tested in a 12-week pilot study with 89 young people (48.3% male; age $M = 19.8$ years, $SD = 3.3$ years). Eligible participants were recruited via liaison with four headspace early-intervention centres in north-western Melbourne.

Results: 56.8% of the sample reported social anxiety symptoms in the severe or very severe range at baseline. Results demonstrated the Entourage intervention was feasible, safe, and potentially acceptable, with 98.6% of participants reporting they would recommend Entourage to another young person experiencing social anxiety. Usage results were also comparable across male and non-male participants. Results showed that young people reliably and significantly improved on clinical and social variables. In particular, young males showed a clinically significant improvement on social anxiety symptoms ($d = 0.79, p < .001$), depression ($d = 0.71, p < .001$), belongingness ($d = 0.58, p = .001$), increased feelings of social connectedness ($d = 0.46, p = .004$) and decreased loneliness ($d = 0.46, p = .006$). Non-male participants also experienced a significant increase in social connectedness ($d = 0.76, p < .001$), alongside reduced social anxiety ($d = 0.78, p < .001$) and experiential avoidance ($d = 0.81, p < .001$).

Conclusions: Entourage is a highly engaging and potentially effective intervention that represents a novel combination of features designed both to reduce social anxiety symptoms and improve social connection among young people. Entourage demonstrated some acceptability, feasibility and safety, with encouraging benefits to clinical and social variables. Entourage also showed favorable results for the engagement and support of young men with social anxiety symptoms.

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1. Introduction

Social anxiety is one of the most prevalent mental health disorders affecting young people, with symptoms typically emerging during mid-late adolescence (Crome et al., 2015; Kessler, 2003; Spence et al., 2018; Stein et al., 2017a). Social anxiety is characterised by an intense and persistent fear of being negatively evaluated by others in social situations, often resulting in thoughts and behaviours that maintain the disorder (Clark, 2005; Hofmann, 2007). Individuals with social anxiety symptoms commonly experience feelings of loneliness and social disconnectedness (Lim et al., 2016; Meltzer et al., 2013), as well as increased risk for depression, suicidal ideation, substance use and interpersonal issues (Aderka et al., 2012; Buckner et al., 2017; Stein et al., 2017a; Stein et al., 2017b). Subthreshold social anxiety symptoms affect a wide range of young people who may not meet full diagnostic criteria for social anxiety disorder but still experience significant distress and impairment in daily functioning. Addressing social anxiety symptoms early before progression to clinically significant level of impairment is therefore an important consideration for service provision.

Many young people with social anxiety never seek treatment for the disorder (Crome et al., 2015). Reasons for this are often due to symptoms of social anxiety itself, such as fear of negative evaluation, embarrassment, and symptom minimisation, as well as financial or geographical restrictions that limit access to services (Andersson et al., 2006; Crome et al., 2015; Grant et al., 2005; Kessler, 2003). There is undoubtedly a growing societal need for efficacious and engaging digital “telehealth” solutions for mental ill-health more broadly (Wind et al., 2020). Particular groups, such as boys and young men tend to experience additional difficulty accessing in-person psychological support for social anxiety due to stigma and cultural norms such as self-reliance (Nicholas et al., 2004; Sen, 2004). Young men are a particularly important population to target, given the lower rates of health service engagement among this group (Rice et al., 2018a, 2018b, 2018c), alongside evidence that social isolation commonly precedes suicidality among young men (Olliffe et al., 2017; Pitman et al., 2012). Digital interventions, offering immediacy of care, increased accessibility, self-directed engagement, and anonymity have the potential to address many of these barriers, and may be especially appealing to young men, who may not be inclined to seek help from traditional sources (Renton et al., 2014; Rice et al., 2018c).

Recent meta-analyses of digital interventions for social anxiety in young people found a small effect in favour of digital interventions when compared to waitlist control groups ($g = 0.45$; Grist et al., 2019), with CBT-based interventions being most effective (Kampmann et al., 2016). Yet high drop-out rates and associated low completion rates were common across studies (Grist et al., 2019; Sportel et al., 2013). Despite this, high participant satisfaction rates were recorded for the included interventions, suggesting that the treatment approaches used were mostly satisfying but have room for improvement in terms of engagement, adherence and clinical outcomes. Further analysis of reasons for low adherence to digital interventions suggest that attrition rates are particularly high in unguided interventions, without the element of human connection or support (Grist et al., 2019; Kähle et al., 2019). Past evidence suggests incorporation of clinical monitoring and support in digital intervention can enhance motivation to continue throughout the course of an intervention (Arnold et al., 2019; Mohr et al., 2011). Additionally, a growing body of literature highlights that young people experiencing mental ill-health report benefits of interacting with and supporting peers online, commonly engendering a sense of solidarity (Naslund et al., 2016). Support from a trusted professional, alongside benefits to social connectedness offered by peer support, therefore represent promising opportunities to enhancing engagement in digital interventions for social anxiety in youth populations (Lederman et al., 2014).

The main problem at present is that no digital intervention for social

anxiety currently exists that incorporates necessary features to successfully maintain engagement alongside providing treatment for symptoms. Adapting intervention delivery strategies to boost engagement of young males is essential, given evidence that young males are more difficult to recruit to online mental health interventions (Clarke et al., 2015), and can demonstrate reduced treatment adherence in digital interventions for social anxiety (El Alaoui et al., 2015). While incorporating evidence-based therapy content has been a focus of past studies (Grist et al., 2019), no interventions have thus far incorporated *both* regular clinical moderation and peer support in order to specifically promote engagement with the intervention among young males. This presents a pressing opportunity to understand if blending these features together can successfully improve symptoms and promote social connectedness among young people with social anxiety.

To address this, Moderated Online Social Therapy (MOST) offers an innovative intervention model designed to remedy the issues identified from existing digital interventions for mental ill-health (Gleeson et al., 2014). The MOST platform incorporates a number of unique elements such as: i) expert clinical moderation, ii) evidence-based therapeutic content delivered via bespoke comics and iii) peer-to-peer social networking. The MOST model has been successfully piloted in previous studies among young people (and their careers) experiencing a range of diagnoses (Alvarez-Jimenez et al., 2013; Alvarez-Jimenez et al., 2018; Gleeson et al., 2017; Rice et al., 2018a, 2018b, 2018c). MOST is likely to appeal to young people with social anxiety symptoms as it is accessible online, and utilises a stepped-approach to addressing the impact of social anxiety on psychosocial functioning with both moderator and peer support (Rice et al., *in press*). Additionally, an important next step for MOST is understanding the extent to which clinical moderation can be adapted according to current available evidence for efficacious strategies for engaging young men in psychological treatment (Seidler et al., 2018). This is pressing given that young men are a group with known difficulties with engaging in digital therapy for social anxiety (Clarke et al., 2015), alongside experiencing barriers to help-seeking for mental ill-health more broadly (Seidler et al., 2016).

As such, a novel digital platform (Entourage) was developed to address several issues with past social anxiety interventions by: utilising the MOST model; delivering evidence-based therapy content for social anxiety via bespoke therapy comics to improve engagement of young people; including young people with lived experience in the development stage to provide guidance on preferences of young people with social anxiety; incorporating regular scheduled contact with clinical moderators during the intervention phase; and embedding a social network-style platform in order to foster positive social connections and experiences, alongside peer support (Rice et al., 2020). Entourage can therefore be defined as a social media-based digital intervention, in that it blends digital therapeutic content with social networking capabilities that mirror existing social media platforms. The anonymity, accessibility and safety of a digital intervention using the MOST platform may be appealing to young men in particular, who report experiencing high levels of mental health stigma and lower engagement in traditional psychological services (Rice et al., 2018a, 2018b, 2018c). By addressing limitations identified from earlier social anxiety interventions, and drawing on evidence-based therapeutic techniques to target key causal and maintaining factors of social anxiety, it is possible that approaches like Entourage could boost the effectiveness of digital interventions for social anxiety in young people (Alvarez-Jimenez et al., 2016; Farrer et al., 2013; Morris et al., 2015; Rice et al., 2018a, 2018b, 2018c).

1.1. Aims and hypotheses

This pilot study sought to examine the acceptability (i.e., participants' use of the system), feasibility (i.e., capacity to recruit and retain young people in Entourage), safety (i.e., monitoring the occurrence of adverse events and/or symptom deterioration) and potential clinical benefit (according to both clinical and social measures) of a novel

digital intervention for young people with social anxiety. In addition to Entourage demonstrating acceptability, feasibility and safety, the intervention was expected to be associated with improved clinical (e.g., social anxiety, mood, wellbeing) and social functioning (e.g., social support, connectedness) outcomes between baseline and post-treatment.

2. Materials and method

2.1. Design

A 12-week single group, uncontrolled pre-post design was used. The pilot was registered retrospectively with the Australian and New Zealand Clinical Trials Registry (ACTRN12619000923167).

2.2. Participants and inclusion criteria

An initial recruitment target of 110 participants was set to enable sufficient sub-group analysis by gender, while factoring in likely attrition. Recruitment for the Entourage trial was facilitated via liaison with clinical staff across four headspace early intervention centres in the north-western Melbourne region (McGorry et al., 2007).

Young people were eligible to be included in the Entourage pilot on the basis of the following: (i) age 12–25 years inclusive; (ii) a score of ≥ 30 on the Liebowitz Social Anxiety Scale, representing “probable” social phobia (LSAS; Liebowitz, 1987); (iii) familiarity with and willingness to use available crisis supports; (iv) provision of informed consent (including parental consent for young people under 18 years); (v) ability to comply with study procedures; (vi) regular and ongoing internet and/or smartphone access; and (vii) willingness to nominate at least two emergency contacts. The following exclusion criteria were applicable: (i) diagnosis of intellectual disability; (ii) inability to converse in or read English; (iii) comorbid physical health conditions requiring a high level of medical care; and (iv) current diagnosis of a schizophrenia spectrum or psychotic disorder.

2.3. Procedure

Following referral by clinical staff, participants were contacted by a research assistant (RA) for an initial eligibility screen based on social anxiety symptoms in the past four weeks. Eligible participants were invited to attend an in-person baseline assessment at their local headspace centre. Following the provision of informed consent (including parental consent for those < 18 years), participants were asked to provide contact details and baseline demographic information, alongside completion of baseline measures. Following this, the induction session involved the provision of unique login details and a tour of the Entourage platform, alongside prompting participants to complete an initial “strengths survey” to identify and tailor therapy content suggestions (described below). Participants were reimbursed AUD\$30 for their time, and were free to use the Entourage platform on a self-directed basis until the conclusion of the 12-week intervention period. Following this, participants were invited to an in-person post-treatment assessment. This involved completion of the same quantitative survey completed at baseline, alongside a brief survey evaluating participant feedback on their experience, and a semi-structured interview comprising questions evaluating the intervention (qualitative results to be reported in future). All participants were recruited over a 7-month period from November 2018–May 2019. The study intervention period concluded at the end of July 2019. Ethics approval was granted by the University of Melbourne Human Research Ethics Committee (Ethics ID: 1851797).

2.4. Intervention

2.4.1. Intervention development

Entourage represents an adaptation of the MOST model (Alvarez-Jimenez et al., 2016). This is an online platform developed by a multi-disciplinary team, in partnership with young people experiencing mental health problems. Originally developed for young people with psychosis (Lederman et al., 2014), the iteration of MOST applied in Entourage integrates a number of features designed to improve social connection in young people with mental ill-health, and is described in detail elsewhere (Rice et al., 2019). In brief, Entourage incorporates online social networking with a “Wall” feature where participants can “post” and interact with others, similar to other social networking sites. Entourage also includes interactive psychosocial interventions, delivered in the form of bespoke therapy comics. Therapy modules are delivered in individual “Steps”, each targeting a particular aspect of cognitive therapy for social anxiety (such as psychoeducation, cognitive restructuring, reducing safety behaviours, etc.). Each step also includes a “Talking Point” where young people are prompted to discuss the symptoms depicted in the comic with each other. “Actions” also accompany therapy steps, which serve as behavioural tasks participants can implement in the real world to improve social functioning. Finally, Entourage incorporates a “Talk it Out” feature, where users can post unique challenges relating to their symptom experience, which moderators then support through a problem-solving style discussion, designed to help users assist others and learn from shared challenges. The therapy content is individually-tailored to each participant by clinical moderators who can suggest specific content based on individual users’ treatment needs and goals.

2.4.2. Graphic medicine – therapy comics

Entourage incorporates individual psychosocial therapy content delivered via bespoke therapy comics (see Rice et al., 2019 for an example). This approach is grounded in the concept of graphic medicine, defined as the use of comics to deliver healthcare information (Green and Myers, 2010; Williams, 2012). Comics represent a promising medium for delivery of digital therapy for social anxiety, given their benefits to facilitating psychoeducation and a sense of social connection for participants, whereby young people can empathise with the experiences of depicted characters (McNicol, 2017; Spiegel et al., 2013).

2.4.3. Clinical and peer moderation

To support progressive engagement with therapeutic modules, Entourage applied system moderation from expert youth mental health clinicians with significant experience treating mental health concerns in young people. Clinical moderators were trained according to a manualised theory-driven model designed to address key cognitive and behavioural factors known to maintain social anxiety (Clark and Wells, 1995; Rapee and Heimberg, 1997); informed by recommendations for improving system engagement (Arnold et al., 2019; Mohr et al., 2011). Gender-sensitised moderation strategies were also incorporated based on established literature, to boost engagement with the platform among young males (Englar-Carlson and Kiselica, 2013; Seidler et al., 2018). These included solution-focused questioning; applying an action-orientation and structured therapy designed to reach a clear solution; use of accessible language and minimising jargon; and normalizing the experience of mental ill-health among young male participants. Alongside this, young people with a lived experience of social anxiety provided online peer support on Entourage, to help users feel comfortable contributing to the platform and maintain engagement. This was incorporated given the growing body of literature highlighting the benefits of peer support to young people experiencing mental illness (Alvarez-Jimenez et al., 2016). Peer support workers were required to use the system at least twice per week for one month and to complete all therapy modules prior to commencing their role on Entourage. In addition, peer workers completed a one-day workshop of training

specific to providing peer support in an online environment.

2.4.4. Concomitant in-person therapy

Participants continued treatment at their local headspace centre while participating in Entourage. Headspace centres provide early-intervention support to young people aged 12–25 around Australia (McGorry et al., 2007). Young people presenting to headspace can receive support for a range of issues, most commonly mental health concerns and situational stressors, alongside physical and sexual health, drug and alcohol counselling and vocational support (Rickwood et al., 2015). Young people can receive mental health support from a range of health professionals, including general and clinically-endorsed psychologists, occupational therapists, social workers and psychiatrists. An episode of care typically involves initial sessions of intake and assessment, followed by treatment planning and delivery according to common evidence-based treatments (e.g., CBT, acceptance and commitment therapy).

2.5. Outcome measurement

2.5.1. Primary outcomes

A priori criteria for acceptability, feasibility and safety were specified in line with benchmarks developed for previous MOST pilot studies across populations of young people experiencing different mental health disorders (Alvarez-Jimenez et al., 2013; Alvarez-Jimenez et al., 2018; Rice et al., 2018a, 2018b, 2018c; McEnery et al., 2019).

2.5.1.1. Acceptability. Acceptability was indicated if: > 50% of participants logged in to the system at least 10 times over 10 different weeks; and at least 60% of participant's report that Entourage provided timely, relevant and helpful support at post-treatment, according to a purpose-designed Entourage experience survey.

2.5.1.2. Feasibility. Feasibility was indicated if: recruitment exceeded 75% of the initial target; refusal rate from participants was < 50%; positive feedback regarding participant usage was received and perceived benefit of Entourage is observed by the moderation team; and at least 50% of participants are retained for the post-treatment assessment.

2.5.1.3. Safety. Safety was indicated if: there were no reported adverse events (i.e., acts of self-harm or suicidal behaviour) that are attributable to the Entourage intervention. This was assessed via system monitoring by clinical moderators for any indication of this behaviour (i.e., user comments disclosing self-harm or suicidal intent). The causal role of Entourage in any events was determined by a study medical officer in line with standard MOST protocol (Bailey et al., in press). Safety was also indicated if there was no significant deterioration in measures of self-reported depression (PHQ-9; Kroenke et al., 2001) or social anxiety (LSAS; Liebowitz, 1987), according to reliable change indices; and all participants report feeling adequately supported by clinical moderators.

2.5.2. Secondary outcomes

A range of measures were used to assess clinical and social functioning of participants (see Table 1).

2.6. Data analysis

2.6.1. Quantitative analyses

Online intervention usage was monitored according to various website analytics reporting engagement with the various features of Entourage. Given the focus on understanding specific outcomes for young male participants, a binary comparison between male and non-male (i.e., female and non-binary participants) was conducted across outcomes. System usage, recruitment progress and participant feedback were used to determine achievement of acceptability, feasibility and safety indicators. Means and SDs were evaluated and paired sample *t*-tests were conducted to examine pre-post changes. Within-group effect sizes (Cohen's *d*) were calculated. The Reliable Change Index (RCI) was employed to determine whether the change in individual scores between baseline and post-treatment was reliable and statistically significant (Jacobson and Truax, 1991). The RCI for each individual across measures was computed by dividing the difference between pre- and post-treatment scores by the standard error of the difference, and only computed using cases where full data was provided (Jacobson and Truax, 1991). An RCI equal or > 1.645 (cut-off score typically used in clinical research; Bowden, 2017) indicates that the individual's change score is significantly greater than expected if due to random measurement error. Exploratory non-parametric (Spearman's rho) were examined for the LSAS in relation to background treatment received and indices of system usage. Multiple imputation was used to impute data

Table 1
Psychometric scales used to measure clinical and social constructs.

Construct	Measure
Depression	Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001) Male Depression Risk Scale (MDRS-22; Rice et al., 2013)
Wellbeing	Short Warwick Edinburgh Mental Wellbeing Scale (SWEMWBS; Stewart-Brown et al., 2009) World Values Survey – Life Satisfaction Scale (Minkov and Hofstede, 2012) European Social Survey – Daily Activities (Campos-Matos et al., 2015)
Social connectedness	Abbreviated Duke Social Support Index (DSSI; Koenig et al., 1993) Revised UCLA Loneliness Scale (UCLA; Russell, 1996) Social Connectedness Scale (SCS; Lee et al., 2001)
Social anxiety	Interpersonal Needs Questionnaire (INQ; Van Orden et al., 2012) Liebowitz Social Anxiety Scale (LSAS; Liebowitz, 1987) Brief Fear of Negative Evaluation from Others Scale (BFNE; Leary, 1983) Anxiety Sensitivity Index (ASI; Reiss et al., 1986) Social Interaction Anxiety Scale (SIAS; Mattick and Clarke, 1998)
Experiential avoidance	Acceptance and Action Questionnaire (AAQ; Bond et al., 2011)
Self-compassion	Self-Compassion Scale – Short Form (SCS; Raes et al., 2011)
Public speaking cognitions	Self-Statements during Public Speaking scale (SSPS; Hofmann and DiBartolo, 2000).
Social support network	Lubben Social Network Scale (LSNS; Lubben and Gironde, 2004)
Self-esteem	Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965)
Emotion regulation	Emotion Regulation Questionnaire (ERQ; Gross and John, 2003)
Guilt and shame	Personal Feelings Questionnaire 2 – Brief (PFQ2-B; Rice et al., 2018b)

Note. Refer to reference list for full information on outcome measures. Alpha reliability coefficients are provided in the supplementary information.

for the small amount of missing cases determined to be missing completely at random for participants who completed both baseline and post-treatment assessment (see Supplementary Table 5).

3. Results

On the basis of the criteria in Section 2.2, 190 young people were initially contacted about Entourage. Participation was refused by 35 young people; 12 were ineligible; 45 did not respond; and 9 were interested but failed to attend a baseline induction assessment. This resulted in 89 young people consenting to participate in Entourage, and completing the baseline assessment and induction into the platform. Thirteen participants were lost to post-treatment with 76 (85.4%) completing the post-treatment assessment. At post-treatment, participants had completed an average of 3.63 ($SD = 2.45$) concomitant in-person therapy sessions. Regarding psychiatric medication, 30 participants (33.7%) reported concurrent medication at baseline, 34 (38.2%) reported no medication and 25 (28.1%) did not disclose this information.

Of the 89 participants recruited, 43 were male (48.3%; inclusive of three transgender male participants), 42 (47.2%) were female, and 4 (4.5%) were gender non-conforming. The average age of participants was 19.8 years (range 14–25 years). Most participants were students (37.1%; $n = 33$), or working part time or casual (23.6%; $n = 21$). 62.9% lived with parents or family ($n = 56$), with the remainder living with friends or a partner in shared accommodation. Most individuals were born in Australia (73%, $n = 65$). In terms of level of education completed, most had completed some high school (34.8%, $n = 31$) or completed high school (31.5%, $n = 28$), the remainder had completed some form of higher education.

3.1. Baseline symptom severity

At baseline 9.9% reported mild social anxiety symptoms, 12.3% moderate symptoms, 21.0% marked symptoms, and 56.8% severe or very severe social anxiety symptoms (LSAS; Liebowitz, 1987). A total of 40.4% of participants reported suicidal ideation in the 2 weeks preceding assessment, and comorbid depression symptoms were common across the sample: 6.8% minimal depression; 13.6% mild depression; 31.8% moderate depression; 30.7% moderately severe depression; and 17.0% severe depression (PHQ-9; Kroenke et al., 2001).

3.2. Primary outcomes

3.2.1. Acceptability

A total of 25.8% ($n = 23$) participants met the a priori acceptability

criteria (logging on to Entourage at least 10 times over 10 different weeks), however 60.7% ($n = 54$) logged in weekly over 5 weeks. In addition, at post treatment, 74.4% of participants reported that Entourage provided timely support; 62.2% of participants reported the therapy content in Entourage was relevant to developing control over social anxiety symptoms; and 77.0% of participants found Entourage to be at least somewhat helpful.

3.2.2. Feasibility

All five a priori feasibility indicators were met: 80.9% of the initial recruitment target (110) was achieved; the refusal rate for the study was 18.4%; participants gave positive feedback about the platform with 98.6% reporting they would happily recommend Entourage to another young person experiencing social anxiety; both peer and clinical moderators provided favorable reflections; and 85% of participants were retained for the post-treatment assessment.

3.2.3. Safety

All participants reported feeling safe and adequately supported by clinicians on the Entourage intervention: measured using a 5-point Likert scale from “not at all safe” to “very safe”, 94.1% ($n = 32$) of participants reported feeling safe while using the Entourage intervention and no participants reported feeling unsafe. No serious adverse events were reported during the intervention. Two (2.74%) participants showed reliable deterioration in depressive symptoms according to the PHQ-9, and 4 (6.67%) participants experienced reliable worsening of social anxiety symptoms as measured by the LSAS.

3.3. Usage results

Over the duration of the intervention, there were 1583 individual system logins from participants ($M(\text{sample}) = 17.8$; $M(\text{male}) = 19.9$). There was high participant usage of the Steps (comic therapy modules) with 1534 completed in total ($M(\text{sample}) = 17.2$ modules completed; $M(\text{male}) = 14.4$) with an average of 4.2 Actions completed per user ($M(\text{male}) = 3.9$). Throughout the pilot there were 19 separate Talk it Out group-based problem-solving topics pitched by participants and developed into solutions, with a total of 156 interactions for these. The Talking Point feature also received substantial engagement, with 80 total contributions to these discussions from participants. An independent samples *t*-test showed no significant differences in usage patterns between males and non-male participants. See Table 2 for full sample and male participant means and standard deviations for each component of the Entourage intervention.

Table 2
Independent samples *t*-tests comparing usage between males and non-male participants.

Site component	Total ($N = 89$)	Male ($n = 43$)		Non-male ($n = 46$)		<i>p</i>	<i>d</i>
	<i>N</i>	<i>n</i>	<i>M</i> (<i>SD</i>)	<i>n</i>	<i>M</i> (<i>SD</i>)		
Logins	1583	827	19.23 (23.57)	753	16.37 (14.02)	0.485	0.15
Logins over different weeks	637	310	7.21 (6.41)	325	7.07 (4.74)	0.904	0.03
Social networking – posts	79	45	1.05 (1.77)	34	0.74 (1.57)	0.388	0.19
Social networking – likes given	566	185	4.30 (9.24)	381	8.28 (29.15)	0.394	0.18
Social networking – likes received	796	396	9.21 (8.89)	400	8.70 (9.89)	0.798	0.05
Social networking – comments	168	98	2.28 (5.03)	70	1.52 (3.26)	0.398	0.18
SMS to moderators	423	234	5.44 (7.01)	189	4.11 (5.68)	0.326	0.21
SMS from moderators	1066	546	12.70 (6.22)	519	11.28 (6.34)	0.291	0.23
Therapy modules (steps) completed	1534	618	14.37 (16.41)	910	19.78 (23.19)	0.210	0.27
Actions completed	383	168	3.91 (8.13)	215	4.67 (6.61)	0.626	0.10
Talk It Out – comments*	46	9	0.21 (0.74)	37	0.80 (1.93)	0.057	0.40
Talking Point – comments	80	33	0.77 (1.34)	47	1.02 (2.26)	0.517	0.13

Note. *equal variance not assumed for ‘Talk it Out – Comments’ due to not meeting Levene's Test for Equality of Variance. Cohen's *d* used as measure of effect size.

3.4. Secondary outcomes

3.4.1. Clinical variables

Baseline to post-treatment significant differences and reliable improvements were observed for most clinical outcomes with small to medium effect sizes ($d = 0.26$ – 0.73 ; see Table 3). The exception to this was a non-significant change observed for the Emotion Regulation Questionnaire subscales (ERQ; $p = .691$ and $p = .509$), and the guilt subscale of the Patient Health Questionnaire ($p = .145$). The largest clinical improvement was observed for social anxiety symptoms, as measured by the Leibowitz Social Anxiety Scale (LSAS), with an effect size of $d = 0.73$ ($p < .001$) and 48.33% ($n = 29$) of participants showing reliable improvement. Notably, a decrease in young people's symptoms of depression and suicidality (PHQ-9 full scale: $d = 0.66$, $p < .001$; suicidality item: $d = 0.27$, $p = .026$), increased wellbeing (SWEMWBS; $d = 0.50$, $p < .001$), increase in self-esteem (RSES; $d = 0.47$, $p < .001$) and decreased loneliness (UCLA; $d = 0.63$, $p < .001$) were observed. Additionally, a large percentage of participants showed significant reliable improvement for fear of negative evaluation (38.46%, $n = 25$) and experiential avoidance (46.27%, $n = 31$). A full report of clinical and social outcomes is outlined in Table 3.

3.4.2. Social variables

Similarly, most social variables showed a reliable and significant improvement between time points. Areas of largest improvement were observed for loneliness, social connectedness and thwarted belongingness among young people. Loneliness, as measured by the UCLA, had a significant and reliable improvement ($d = 0.63$, $p < .001$, RCI: 39.13% improved). Social connectedness as measured by the Social Connectedness Scale showed an effect size of $d = 0.63$ ($p < .001$) and 44.12% of participants had significantly improved during the intervention period. Participants showed decreased feelings of thwarted belongingness, measured by the Interpersonal Needs Questionnaire (INQ; $d = 0.58$, $p < .001$) with 32.94% showing significant improvement.

3.5. Gender differences

The sample was split into two groups in order to determine whether similar changes to clinical and social variables were found for both male and non-male (i.e., female and non-binary) participants. Results showed that overall, males showed reliable improvement on 14/22 variables, whereas non-male young people reliably improved on 18/22 variables. Males had a slightly lower median effect size overall (Males med. $d = 0.39$, non-males med. $d = 0.56$). Despite this, male participants showed significant improvements on key measures such as social anxiety (LSAS; $d = 0.79$, $p < .001$), depression (PHQ-9; $d = 0.71$, $p < .001$), loneliness (UCLA, $d = 0.46$, $p = .006$), wellbeing (SWEMWBS, $d = 0.42$, $p = .013$) and showed a reduction in shame (PFQ2-B, $d = 0.40$, $p = .016$). Non-male participants showed largest improvement on social connectedness measures (DSSI, $d = 0.77$, $p < .001$; SCS, $d = 0.76$, $p < .001$), loneliness (UCLA, $d = 0.80$, $p < .001$), social anxiety (SIAS, $d = 0.78$, $p < .001$) and experiential avoidance (AAQ-II, $d = 0.81$, $p < .001$). Full results are provided in Supplementary Tables 3 and 4.

3.6. Associations with social anxiety symptoms

In relation to the LSAS, nonparametric correlations indicated a strong positive association between scores at baseline and post-treatment ($r_s = 0.77$, $p < .001$), however there was no association between baseline LSAS and LSAS difference scores between baseline and post-treatment ($r_s = -0.20$, $p = .081$). There was also no association between the number of headspace sessions received by participants in the active treatment period and LSAS difference scores ($r_s = -0.06$, $p = .641$), indicating that concomitant in-person treatment was unrelated to changes in social anxiety symptoms. There were no associations between LSAS difference scores and number of logins ($r_s = 0.08$, $p = .520$), number of steps completed ($r_s = -0.02$, $p = .018$), or number of actions completed ($r_s = -0.07$, $p = .561$). However, participant ratings of the development of new social connections occurring via Entourage were positively associated with logins to the system

Table 3

Paired sample *t*-test significance levels, effect size and reliable change index for secondary outcome measures at baseline at 12-week post-treatment; full sample.

Construct	Measure	Baseline ($n = 76$)		12-week post-treatment ($n = 76$)		Statistics		RCI (N, %)	
		M	SD	M	SD	<i>p</i>	<i>d</i>	Improve	Decline
Depression	PHQ-9	13.74	5.63	10.52	5.69	< 0.001	0.66	22, 30.14%	2, 2.74%
	MDRS-22	40.17	19.40	35.56	21.13	0.010	0.30	12, 20.0%	7, 11.67%
Wellbeing	SWEMWBS	19.58	3.69	21.82	4.41	< 0.001	0.50	21, 28.38%	5, 6.76%
	WVS*	5.24	1.90	5.98	1.88	< 0.001	0.41	–	–
	ESS*	2.02	0.61	1.97	0.75	0.580	0.07	–	–
Social connectedness	DSSI	28.64	5.67	31.37	6.28	< 0.001	0.50	13, 20.0%	3, 4.62%
	UCLA	53.95	9.90	48.39	10.58	< 0.001	0.63	27, 39.13%	5, 7.25%
	SCS	62.96	16.22	72.11	18.74	< 0.001	0.63	30, 44.12%	6, 8.82%
	INQ - perceived burdensomeness	16.42	8.95	12.81	8.33	< 0.001	0.48	23, 31.94%	7, 9.72%
	INQ - thwarted belongingness	36.79	9.66	31.23	11.98	< 0.001	0.58	23, 32.39%	2, 2.82%
Social anxiety	LSAS	85.40	23.72	73.65	25.62	< 0.001	0.73	29, 48.33%	4, 6.67%
	BFNE	50.30	9.66	47.07	10.46	0.001	0.37	25, 38.46%	4, 6.15%
	ASI	35.39	14.28	31.53	13.40	0.003	0.34	20, 30.77%	6, 9.23%
	SIAS	54.75	11.06	49.46	13.47	< 0.001	0.53	21, 33.87%	4, 6.45%
Experiential avoidance	AAQ-II	34.08	7.56	28.95	10.41	< 0.001	0.61	31, 46.27%	5, 7.46%
Self-compassion	SCS	27.55	5.45	29.70	7.20	0.003	0.35	12, 18.46%	3, 4.62%
Public speaking cognitions	SPSS - positive	8.96	3.92	10.60	4.76	0.003	0.34	14, 21.54%	5, 7.69%
	SPSS negative	16.90	4.95	14.00	5.91	< 0.001	0.56	27, 40.91%	5, 7.58%
Social support network	LSNS	12.80	5.49	13.77	5.41	0.027	0.26	5, 7.35%	3, 4.41%
	RSES	21.59	5.20	23.71	5.41	< 0.001	0.47	19, 28.79%	5, 7.58%
Emotion regulation	ERQ - reappraisal	23.17	7.18	23.64	7.71	0.691	0.05	14, 21.21%	16, 24.24%
	ERQ - suppression	15.87	4.58	16.36	5.18	0.509	0.08	10, 15.38%	5, 7.69%
Guilt	PFQ2-B	6.11	2.31	5.73	2.46	0.145	0.17	9, 12.68%	5, 7.04%
Shame	PFQ2-B	8.80	3.67	7.45	3.96	< 0.001	0.47	14, 19.18%	4, 5.48%

Note. *World Values Scale (WVS) and European Social Scale (ESS) are single item measures which cannot provide alpha reliability coefficients required for RCI computation. Refer to reference list for full information on outcome measures. Boldface text reflects significance according to a Bonferroni-adjusted *t*-test based on 20 measures with a significance benchmark of $p < .0025$.

($r_s = 0.39, p = .001$), number of therapy steps completed ($r_s = 0.31, p = .007$), number of actions completed ($r_s = 0.35, p = .002$), as was the usage composite score summing logins, steps and actions ($r_s = 0.37, p = .001$).

4. Discussion

4.1. Principal results

To our knowledge, this is the first study to evaluate a social media-based intervention with an emphasis on gender-sensitised clinician and peer support for social anxiety symptoms in a youth population. The main findings support Entourage being potentially acceptable, alongside promising results for feasibility and safety. Exploratory analyses indicated that at the total sample level, Entourage was associated with improved outcomes for a number of clinical and social variables impacted by social anxiety symptoms and was not associated with any harm to young people. Entourage also represents an innovative approach to boosting social connection among young males, which represents promising progress given past evidence of lower engagement with digital interventions among this group (Clarke et al., 2015; El Alaoui et al., 2015). While young males improved reliably on slightly fewer measures than non-males, male participants appeared to engage just as well with the intervention according to usage statistics and retention rates. A number of factors may have contributed to this; namely gender-sensitised moderation strategies, anonymity and immediacy of access to therapeutic content, in line with past evidence of the effectiveness of such techniques in helping young males engage with mental health support (Seidler et al., 2018).

Regarding acceptability, only 25.8% of participants met the criteria for number of logins, while 60.7% logged in weekly over 5 weeks. While we did not meet the initial acceptability criterion, it is possible that a login count is not an ideal indicator of acceptability for young people with social anxiety, as participants reported universally positive feedback on aspects of the site such as therapy content and safety. This indicates that the a priori acceptability criteria may have been too strict, particularly given the assumption that more logins by participants automatically results in more positive clinical outcomes. Participant feedback indicated that 98.6% of participants would recommend Entourage to another young person experiencing social anxiety. Therefore, perhaps a significant proportion of participants experienced increased social connectedness from being part of the intervention, which may have been independent from frequency of logins. In line with this, Smith et al. (2017) previously found evidence to suggest that more logins on a platform does not always equate to more positive outcomes. They suggest that while treatment adherence is important, there may not be a 'set' dose for each individual to experience positive benefit, which may have been the case in Entourage. Qualitative data gathered from semi-structured interviews with participants at post-treatment may provide further insight into reasons why participants did not maintain weekly usage over the intervention period. Reporting these results in detail is beyond the scope of the current paper but will be explored in the future.

The social networking features of Entourage did not receive extensive engagement from participants. This could be explained by evidence that young people with social anxiety tend to engage with social networking systems in unique ways. Shaw et al. (2015) have highlighted adolescents with social anxiety tend to engage in more passive use ("lurking"); and Seabrook et al. (2016) demonstrated young adults with social anxiety tend to spend time viewing posts from others rather than directly interacting with sites themselves. Past scholarship around "lurking" could explain why participants did not post or interact extensively in 'the Café', as social anxiety around public speaking tends to extend to online spaces (Bonetti et al., 2010). As mentioned earlier, given largely positive feedback was received, perhaps participants experienced improved connectedness in being a part of Entourage,

without necessarily needing to post frequently in the social networking space (Valentine et al., *in press*).

The achievement of all feasibility criterion is encouraging, as one would expect to encounter additional challenges recruiting and retaining young people with social anxiety in research which involves necessary in-person contact, often with unfamiliar members of a research team. The retention rate of 85% observed here, alongside the achieved sample size of 89 young people, both compare favourably to past CBT-derived digital interventions for social anxiety, where small sample sizes and participant attrition are common limitations (Sportel et al., 2013; Kampmann et al., 2016). A number of strategies may have assisted recruitment success and minimization of attrition, such as scheduling research assessments before or after participants' therapy sessions, or allowing initial screening via SMS given the preference for SMS contact over phone calls among youth with social anxiety (Reid and Reid, 2007). Regarding safety, the achievement of safety criterion indicated that a sufficiently supportive online community was established, that did not lead to any adverse events or deterioration in symptoms attributable to the intervention itself. This may have been expected due to participants being recruited from headspace early-intervention services in which support and monitoring is also provided by their regular mental health clinicians. Nevertheless, a large proportion of the study sample experienced suicidal ideation at baseline and throughout the study, so meeting safety indicators is an encouraging result.

Most participants found using the platform to be satisfying and a positive experience. One feature wherein this may have manifested is in the use of the "Talking Points". The "Talking Point" feature embedded within each Step received extensive engagement from participants. This may have been because participants found it less daunting to contribute to the "Talking Point" discussions, as these were prompted, and involved discussions about the shared experience of the particular presenting symptom depicted in the Step rather than spontaneously posting content in the more 'public' newsfeed section. Indeed, Naslund et al. (2016) have highlighted the increasing utility of online forums where young people can discuss shared symptoms of mental ill-health. This engagement may have been facilitated by the application of graphic medicine, as comics depicting medical narrative are known to facilitate a sense of solidarity among individuals experiencing adverse symptoms (McNicol, 2017). Furthermore, participants in Entourage engaged well with the "Talk it Out" feature – suggesting this novel opportunity to understand how other young people manage their symptoms was appealing to young people and potentially contributed to the sense of supportive community that was achieved. The unique benefits afforded by these features will be an area of future enquiry.

4.2. Secondary outcomes – social and clinical variables

The results from the current study compare favourably to previous trials investigating the effectiveness of digital interventions for social anxiety in young people. In a meta-analysis conducted by Grist et al. (2019), four studies were reported that delivered an online intervention specifically targeting SAD in young people, with effect sizes ranging from 0.11 to 1.23. In an Australian study using the most similar intervention design to the current study, Spence et al. (2017) found that social anxiety symptoms were improved with an effect size of 0.70, which aligned closely with our results which showed an overall effect size of $d = 0.73$ for social anxiety symptoms with 48.3% of participants experiencing reliable improvement. There was some variability in effect sizes for the different measures of social anxiety included, which could be explained by variation in the specific symptoms assessed by each measure. For example, where the LSAS measures general fear or avoidance of social situations (Liebowitz, 1987), the BFNE scale specifically measures concern regarding negative judgment from others, without reference to specific situations (Leary, 1983). Given the comics presented in Entourage typically involved depiction of specific social

situations, it could be that the therapy content had a greater effect on more general fear or avoidance of these situations, potentially explaining the difference in effect size observed between the LSAS and BFNE. Considering the wide range of effect sizes reported by other studies evaluating digital interventions for social anxiety, and variation in intervention design and implementation, the current study's results fit conservatively within the current literature (Grist et al., 2019; Kampmann et al., 2016).

Inclusion of targeted therapy content, moderation techniques, peer support and the opportunity for social networking in a safe, supported environment may have contributed to positive changes in social connectedness and decreased loneliness among participants. This is promising given social disconnection is a common feature among socially anxious young people, and loneliness can maintain social anxiety symptoms over time (Lim et al., 2016). The holistic approach to digital therapy for social anxiety symptoms used in Entourage appears a viable approach to not only symptom reduction, but simultaneously boosting social connection. It is also noteworthy that symptoms of depression reduced across the intervention period, alongside a significant reduction in participants' perceived burdensomeness and thwarted belongingness. While we cannot make any casual inferences because of the uncontrolled nature of the study and the concomitant background treatment, this is nevertheless an encouraging finding particularly given these factors are key markers of suicide risk in young people (Barzilay et al., 2015). Interpersonal difficulties are also thought to, at least in part, explain higher rates of suicidality among young people with social anxiety (Buckner et al., 2017). Additionally, a meta-analysis of the association between perceived social support and depression in childhood and adolescence has highlighted that perceived social support, even without treatment, can alleviate depressive symptoms in youth (Rueger et al., 2016). The social support afforded by Entourage may therefore have had a positive influence on the affective symptoms of participants. Future controlled studies should aim to uncover the specific mechanisms underlying both the social and clinical benefits of a system like Entourage for youth with social anxiety.

4.3. Limitations and future directions

Given the primary aim of the study was to determine the acceptability, feasibility and safety of the intervention, results regarding social and clinical measures must be interpreted cautiously. The uncontrolled design of the study also means that changes in clinical and social measures cannot be attributed to Entourage alone. Additionally, information regarding participants' stage of in-person treatment when Entourage commenced was not recorded. This represents a limitation as participants nearing completion of an episode of care may have experienced different outcomes from those closer to the commencement of treatment. The number of sessions completed while participants used Entourage was nevertheless unrelated to decline in social anxiety symptoms, lending support for the positive results observed. Furthermore, participants recruited for the intervention were already seeking psychological support from headspace early intervention services. This makes the generalisation of Entourage to the wider non-help seeking population of young people with social anxiety unknown, as those attending headspace may have been more inclined to use Entourage than the general population. However, there is evidence that online forums for young people to discuss mental ill-health and support others are beneficial, highlighting that uptake may also be higher from the general population of young people with social anxiety (Naslund et al., 2016; Nicholas et al., 2004).

While young people in the study had clinically significant levels of social anxiety according to the LSAS, the rate of threshold diagnosis is unknown in the current sample, as a diagnostic interview was not conducted (e.g., Structured Clinical Interview for DSM-V). This limits the extent to which the results of the current study can be generalised to young people experiencing full threshold social anxiety disorder.

However, well over 50% of the sample reported severe or very severe symptoms on the LSAS, and the study's subthreshold social anxiety disorder inclusion criteria meant that only sufficiently symptomatic young people could access the intervention. Mennin et al. (2002) also demonstrated concordance between LSAS cut scores used in the present study, and the identification of individuals with SAD as assessed by diagnostic interview. Results also indicate improvement on reliable scales measuring social anxiety, providing positive indications of the internal validity of the intervention.

In terms of the therapeutic benefit, several scholars have highlighted ways in which social media could inadvertently jeopardise therapy for social anxiety symptoms instead of aiding treatment, by allowing youth to more intensely engage in safety behaviours and social comparison which can maintain the disorder (Campbell et al., 2006; Harman et al., 2005). Suicide prevention research has implicated the potential harm social media can have on young people in terms of normalizing suicide behaviours, triggering maladaptive behaviour in others and cyber-bullying (Hawton et al., 2019). Conversely, the authors also highlight the potential benefit of social media to deliver crisis support, provide a sense of connection to young people, deliver therapy and reach isolated groups (Hawton et al., 2019). These important considerations were addressed in the design of the Entourage intervention by requiring participants to be accessing services at their respective headspace centres in order to maintain clinical oversight, as well as via safety features embedded within the intervention to detect distress, provide support and provide support where necessary. Many current digital interventions do not require the individual to be conjunctively accessing in-person support, so future studies should seek to maximize the benefits to social connection afforded by social media-based interventions for social anxiety. This could be achieved by refining and expanding features that achieved engagement from young people in Entourage (such as Talking Points), alongside refining peer moderation, as this demonstrated promise in this study.

As discussed, participants were specifically recruited via early-intervention mental health services in order to facilitate clinical monitoring. This requirement nevertheless restricts the extent to which these results can be generalised to socially-anxious youth who may not be seeking in-person treatment. Entourage was not developed with the intention of being a stand-alone support service, with the idea being that socially anxious young people may benefit from targeted adjunct support. The results of the present study do however lend support to the idea of a dedicated, online peer support service for young people experiencing social anxiety while they wait for more intensive in-person support. The demand for community mental health services for young people in Australia is high, with young people commonly needing to wait several weeks for an appointment to be available (Rickwood et al., 2015). A system like Entourage could therefore provide first stage support to young people, particularly given Entourage allows immediate access to evidence-based therapy modules. Important considerations would include the refinements of peer support and moderation strategies in order to cater for high numbers of young people accessing the service. Given many young people with social anxiety never access treatment (Crome et al., 2015), ensuring adequate timely support is provided to those that do seek help is paramount. Evidence for the feasibility and safety of Entourage suggests it provides a potentially viable application to address this need.

Finally, detailed qualitative interview data was also collected from participants on their experiences of Entourage, including feedback and suggestions for improvement. In-depth results from these interviews will be presented in a forthcoming qualitative manuscript.

4.4. Conclusions

While other digital interventions for social anxiety in young people have also shown promising results in addressing social anxiety symptoms, Entourage represents a novel combination of features designed

both to reduce social anxiety symptoms and improve social connection among young people. Indeed, a recent systematic review of apps for social anxiety demonstrated that no other service currently available offers the same level of integrated functionality designed to specifically target social anxiety (Alyami et al., 2017). Entourage demonstrated promising acceptability, feasibility and safety, with encouraging, albeit uncontrolled benefits to clinical and social variables. Entourage also represents a promising step forward in the design of targeted interventions to boost health service engagement among young men.

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Data statement

Per ethics approval granted for this study, the research data is confidential. Please contact the corresponding author regarding analyses undertaken.

Declaration of competing interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.invent.2020.100323>.

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