

**A mixed methods exploration of the psychological effects of short term fasting in healthy individuals.**

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**Thesis declaration form**

I confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

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## Overview

**Part 1:** This thesis begins with a review of the literature on the impact of social media on body image and eating disorder psychopathology. The review includes 14 articles, reporting on 13 studies, which reported specifically on social networking sites and body image and/or eating disorder psychopathology. A number of studies showed an association between time spent on social networking sites and body dissatisfaction and particular features including photo sharing and commenting were linked to such associations. However, methodological issues limit any conclusions that can be drawn.

**Part 2:** The literature review is followed by a mixed methods empirical study exploring the psychological experience of short-term fasting in healthy individuals. This aims to expand on existing literature in relation to anorexia nervosa. Participants fasted for 20 hours, completed two hourly EMA measures and a follow up interview. Results showed each individual's experience of fasting to be unique, however several common factors were identified which include positive emotional experience, an increase in negative emotion on recommencement of eating and the role of intrusive thoughts and subsequent psychological techniques employed. These are discussed in relation to relevant theory and clinical intervention.

**Part 3:** The empirical paper is followed by a critical appraisal of the work. This appraisal reflects on the process of undertaking both the literature review and empirical research. Reasons for choosing the topic, along with any prior assumptions are discussed and methodological dilemmas are explored including use of a fasting paradigm, use of small-N design, data gathering, self-report and use of a non-clinical sample. Personal reflections on the process of conducting research are also discussed.

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## **Part 1: Literature Review**

### **The impact of Social Media on body image and eating disorder psychopathology**

## **Abstract**

**Aims:** There is concern that the recent rise of social media may lead to body image concern and potentially increased eating disorder (ED) psychopathology. The aim was to provide a recent review of the association between social media, in particular social networking sites, on body image and ED psychopathology.

**Method:** Three electronic databases along with references lists were searched to identify articles which reported on both social media and body image and/or ED psychopathology.

**Results:** The search yielded 1309 articles on internet use and body image, of which 52 reported specifically on social media and body image or ED psychopathology. Fourteen articles, covering 13 studies reported specifically on social networking sites and body image or ED psychopathology, and met inclusion criteria.

**Conclusions:** A number of studies showed an association between time spent on social networking sites and an increase in body image concern and/or ED psychopathology. Particular features of social networking sites, such as photo sharing and commenting, were shown to be responsible for much of the association and were discussed in relation to theories of social comparison and peer competition, amongst others. However, studies were mainly of correlational design, and used varying methodologies and assessment tools, thus limiting the conclusions that could be drawn.

## **Introduction**

### **Social Media and body image**

### *Social media use*

Over the last two decades patterns of media use have altered immensely. Previously the most popular forms of media were television, films, radio and magazines and much research has been carried out in this area in relation to body image. More recently, however, the use of newer digital media, such as the internet and smart phones, has changed the landscape of media communication.

The nature of social media is complex and has unique qualities that are different to previous forms of mass media. For instance, people's use of social media is no longer limited to consumption, they take a more 'active' role in also disseminating content (Prieler & Choi, 2014). The messages can be created quickly, and responded to almost immediately. This may give individuals the feel of interpersonal communication despite not targeting one particular person or group. Perloff (2014) notes that social media is a far more personal outlet than conventional forms of 'mass' media. In this way social media can provide a sense of connectedness through interactivity and may link people to other like-minded individuals.

However, the uniqueness of social media may bring with it certain difficulties. Compared with other forms of media, individuals are more likely to be exposed to media messages they have not sought out when other people post messages, make comments or share links (Andsager, 2014). In addition, amateur and potentially damaging content can be produced and viewed on social media which might not have been disseminated through mass media if deemed inappropriate (Andsager, 2014). However, as a counter argument, there are many independent messages coming through social media that could potentially challenge current stereotypes.

### *Social media and body image vulnerability*

Social media, and social networking sites in particular, may provide more ‘appearance’ related information than traditional forms of media due to unique features such as photo sharing and being able to give or receive feedback. This provides an opportunity to interact with appearance related information in a way previously not available. Perloff (2014) suggests that certain uses and gratifications from social media may intervene between predisposing individual differences and attitudinal or behavioural outcomes in relation to body image. For instance, individuals with a pre-existing vulnerability to developing eating disorder symptomology may gravitate towards appearance focused content on social media and seek particular gratifications such as reassurance or validation. Currently, little is known about the effects of these specific social media features on body image disturbance.

It is important to be aware, however, when considering the effects of social media not to create a moral panic. Turner (2014) drew parallels between the current sense of ‘panic’ over social media with previous states of alarm over other new media such as the move from print media to radio and television. He explored the positive effects of social media and noted that social media can have positive effects on self-esteem and psychological wellbeing. In addition, many young people use social media to seek support from others with regard to mental health or eating disorders.

It would therefore be of benefit to explore the relationship between social media and body image in terms of both potential positive and negative effects.

#### *Definition of social networking sites*

Prieler & Choi (2014) noted that to fully understand the effect of social media on body image it is important to specify the type of social media use. There are two main types of social media use in relation to body image. Firstly there is use that is driven by a specific need

linked to body image concerns such as the use of pro-eating disorder websites. There is a body of research pertaining to this (For example, Borzekowski, Schenk, Wilson & Peebles 2010; Custers & Van den Bulck, 2009; Harper, Sperry & Thompson, 2008; Ringwood, 2008). Secondly there is social media use which is driven more by motivations such as socialising or entertainment.

This review focuses on the second type and refers predominantly to social networking sites as the literature in this area is less developed. The definition used for a social networking site in this review is a site where individuals:

- Construct a public or semi-public profile within a bounded system
- Articulate a list of other users with whom they share a connection
- View and traverse their list of connections and those made by others within the system

(Boyd & Ellison, 2008)

## **Relevant theory**

### *Social comparison theory*

Social comparison theory (Festinger, 1954) has been used as a theory for understanding body image in a number of studies. Festinger described how individuals have an innate motivation to evaluate themselves. The theory suggests that upward comparisons (i.e. an ideal of beauty found in the media) can evoke negative feelings and body dissatisfaction, whilst downwards comparisons (i.e. comparisons with those who might be deemed unattractive or heavier) can evoke increased body satisfaction (Taniguchi & Lee, 2012). For example, Irving (1990) found that people who were exposed to images of plus size models had higher body

satisfaction than those exposed to images of thin models. In addition, whilst much of the research has focused on comparison with media images, females have also been found to compare themselves with their peers to the same or a greater extent (Taniguchi & Lee, 2012). Mussweiler (2009) pointed out that people frequently relate information to themselves when they are confronted with information about others. This can be both peers or strangers in the media. A meta-analysis of 170 studies found that 156 studies related social comparison to body dissatisfaction (Myers & Crowther, 2009). Social media appears to provide opportunity for such social comparison with both peer and media figures.

### *Peer influence*

Along similar lines to social comparison, peer influence is another area that has been linked to body image. A number of studies have found that peer and family pressure for thinness predicted body dissatisfaction in adolescent females (Ferguson, Munoz, Garza & Galindo, 2014). Ferguson, Munoz, Contreras & Velasquez (2011a) found that peer influence, rather than media influence, had the greatest effect on body dissatisfaction and proposed the 'Catalyst model' to explain this. This takes an evolutionary perspective and argues that body dissatisfaction is a direct result of inter-female competition for mates. They state that such competition is likely to be higher in cultures where females have more free choice in selecting mates, where females marry later in life and where food is in abundance and so thinness is seen as a sign of health. The Catalyst model argues that peer influences are likely to have a greater effect than media influences. It would seem again therefore that social media may have more influence than traditional forms of media as competition is with 'real people' as opposed to celebrities. However, in contrast, interacting with peers at a distance may have less of an impact than interactions in real life with peers.

### *'Fat talk' - Social information processing theory*

'Fat talk' is defined as 'body related conversations that revolve around one's desire to lose weight' (Taniguchi & Lee, 2014). 'Fat talk' can bring attention to one's appearance and emphasize the value of thinness. Social Information Processing theory (Salancik & Pfeffer, 1978) states that individuals "adapt attitudes, behaviour and beliefs to their social context" (p. 226). Taniguchi & Lee (2014) suggest that this theory may apply to appearance related conversations where individual attitudes towards appearance and body image could be influenced by peer's appearance related conversations. Meier & Gray (2014) note that social media provide a 'digitalized platform' for real life appearance based conversations that have traditionally taken place in school hallways and playgrounds. In this way social media could create a 'social context' which can influence beliefs and attitudes regarding body image.

#### *Interpersonal formulation*

Rieger, Van Buren, Bishop, Tanofsky-Kraff, Welch & Wilfley (2010) suggested that individuals engage in disordered eating in response to negative social interactions in an attempt to lessen the effect of negative feedback and boost self-esteem. This theory adds that engagement in disordered eating exacerbates interpersonal problems, which in turn intensifies the eating behaviour thus creating a feedback loop. A key feature of many social media sites is posting and receiving feedback from peers (e.g. 'liking' and commenting on photographs) and such sites could therefore provide evidence for this theory.

#### *Self-objectification theory*

Self-objectification theory is thought to be a two-step process where females are trained to objectify females in the media and then transfer this pattern inwards by taking an outsider's perspective on the physical self. (Meier & Gray, 2014). Perloff (2014) described this as the process by which females come to view their bodies as objects to be looked at, much as an observer would. He noted that the internalization of an observer's perspective towards one's

own body can lead to body surveillance, which can lead to body image disturbance. The nature of photo sharing on many social media sites may exacerbate this process. For example, sharing photos for the purpose of receiving an outsider's perspective (comments and 'likes') may lead people to scrutinise their own images first.

In addition, by scrutinising one's own photos and only uploading images deemed to be acceptable, this may skew views of what is 'normal' within peer groups and therefore perpetuate a thin ideal. New applications have been developed for people to alter images before uploading them, thus no longer limiting the ability to create an idealized version of yourself to celebrities (Siibak, 2009). This could lead vulnerable individuals to think these images are more attainable as they are images of 'real people'.

### *Socio-cultural theory*

Tiggeman & Slater (2014) state that Socio-cultural models have provided the most widely accepted framework for understanding body dissatisfaction and disordered eating. This model poses that the current very thin beauty ideal for women is societally reinforced and transmitted by a number of sociocultural influences, of which media and peer influences are the most powerful. Internalization of the thin ideal is said to mediate the effects of both media and peer influence on body image (along with the relationship between body image and eating disorders). Social media can be considered a place where media and peer influence come together, thus making the socio-cultural model particularly relevant.

### **Current review**

There has been considerable research on the effects of mass media on body image and body dissatisfaction (Halliwell & Diedrichs, 2012). Given the rise in use of social media and the unique features associated (i.e. combining traditional media with a peer element) it is thought

that the influence of social media on body image may be greater than that of traditional media. However, little research has been carried out to support this. Whilst the theories discussed above present some useful ideas, there is currently little empirical evidence to corroborate them.

This review therefore aims to explore the findings of recent research on social media and body image. The research questions to be addressed are:

**1) Is social media use associated with body image disturbance or eating disorder psychopathology?**

**2) If so, what are the processes by which social media may influence body image?**

## **Method**

### **Search strategy**

A computerised search of three databases was carried out to identify relevant articles. The databases used were PsychINFO, Medline and Embase. Both thesaurus and text word searches were carried out. The search terms used were 'eating disorder' or 'body image' combined with 'social media'. During the thesaurus search these terms were 'exploded' to include all other relevant terms under those headings. During the text word search a number of alternative terms were included for each search term. No limits were set for date as it is likely that papers reporting on social media would be written relatively recently. Following this a manual search of references from all relevant articles and a citation search was carried out.

**Inclusion criteria**

In this review only papers that were written in English and peer reviewed were included. Papers were required to comment on social networking or social media for general use (rather than specifically focusing on Pro Anorexia content, support groups for people with Eating Disorders or computerised treatment for people with Eating Disorders). Papers were also required to report on either body image or Eating disorder psychopathology.

**Exclusion criteria**

Papers were excluded if they were not written in English, were not peer reviewed or did not contain data, such as editorials or reviews. Papers were also excluded if they referred to more general psychopathology rather than having specific data on body image or eating disorder specific symptoms or explored other forms of internet or social media activity (such as Pro Anorexia content).

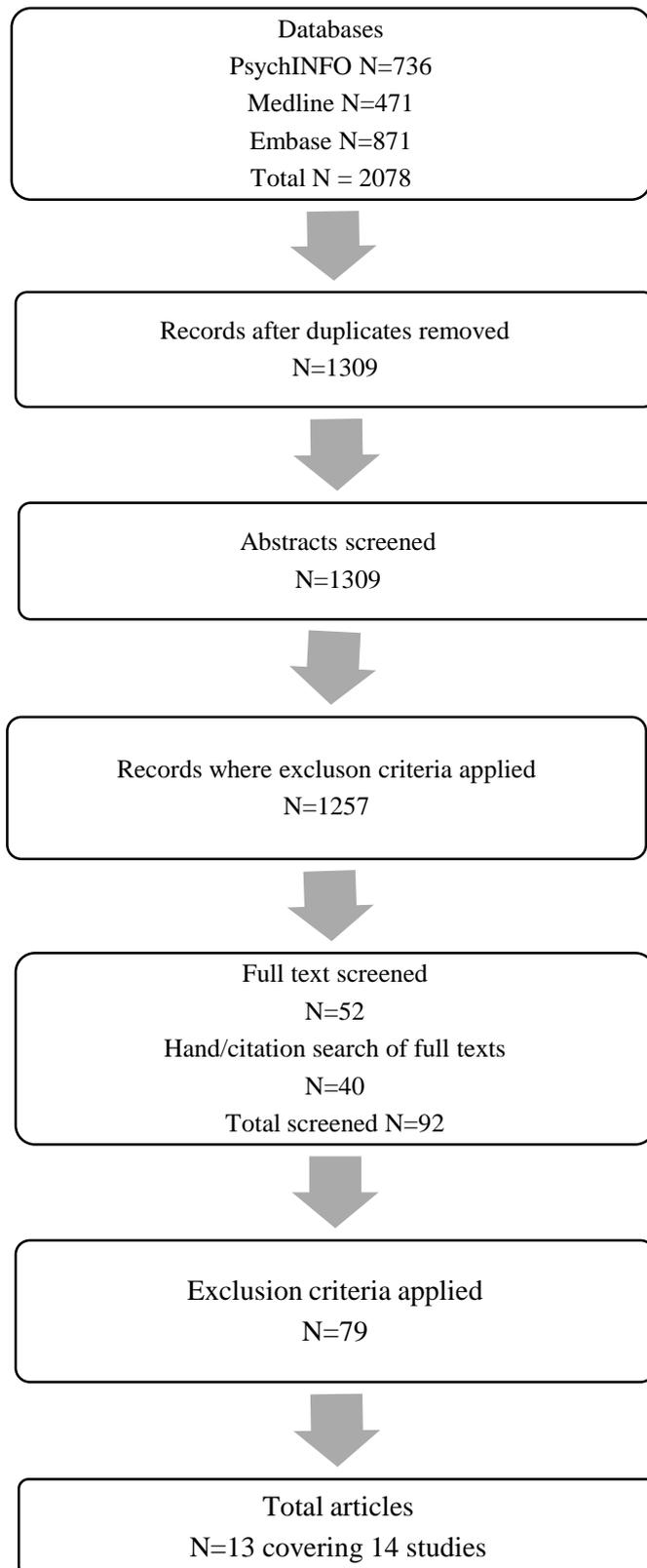


Figure 1: Flow chart of selection process

## Results

No specific checklist was used to assess quality of methodology in this review. This is due to the range of designs found in the papers selected, the majority of the papers being survey designs which meant no validated checklists were available, and the focus of this review being non-clinical. However, methodologies are critiqued (drawing on guidance from CASP) and each study is considered in terms of strengths and weaknesses when considering findings.

### Characteristics of studies

This review considers 14 studies from 13 papers. Only three of the studies examined differences over time (Smith, Hames & Joiner, 2013; Hummel & Smith, 2014; Ferguson, Munoz, Garza & Galindo, 2013), the remainder were cross-sectional in design. Nine of the studies used questionnaires to collect self-report data and aimed to identify associations between social media usage and body image disturbance or eating disorder symptoms (Ferguson, Munoz, Garza & Galindo, 2014; Hummel & Smith, 2014; Lee, Lee, Choi, Kim & Han, 2014; Mabe, Forney & Keel [study 1], 2014; Meier & Gray, 2014; Smith, Hames & Joiner, 2013; Tiggeman & Miller, 2010; Tiggeman & Slater, 2013; Tiggeman & Slater, 2013(a)). Five of the studies utilized an experimental design, and employed a mock up or manipulation of a social networking site (Haferkamp & Kramer, 2011; Mabe, Forney & Keel [study 2], 2014; Veldhuis, Konijn & Seidell, 2014; Taniguch & Lee, 2012; Lee, Taniguchi, Modica & Park, 2013). In each of these studies the different conditions were randomly assigned.

The studies explored social media in different ways. For example, the majority of studies described general social media use or took a number of social media sites into account, where as some only considered particular sites such as Facebook. In addition, four studies explored

overall social media use, using time spent on particular sites as a measure (Tiggeman & Miller, 2010; Tiggeman & Slater, 2013; Tiggeman & Slater, 2013(a); Mabe, Forney & Keel, 2014). The remaining studies considered specific features of social media use, such as photo sharing or receiving feedback.

Each study operationalised eating disorder pathology or body image differently. Concepts such as body dissatisfaction, body image, or appearance comparison were commonly used. A number of studies also looked at other psychological factors such as self-esteem and mood. However, only those factors which are specifically known to be risk factors for the development of ED are commented on in this review. In addition, each study varied in terms of how social media use was measured as there are no standardised measures for this. This measurement was also dependent on the nature of social media use that the study was investigating. For information on how concepts were operationalized and measures used see Table 2.

Participants in the studies were predominantly female (11 out of 14 studies), and the mean age of participants noted in each study were all below 30 years. This is not surprising considering females in adolescence and young adulthood are at the greatest risk of developing eating disorders. The majority of studies took place in a school or university setting. There was variability in country of origin, but the majority were Western studies. This means that generalizability can mainly be assumed within the Western, developed world. In terms of ethnicity the majority of participants in each study were Caucasian, however a number of studies did not comment on the ethnicity of participants. Three studies compared ethnicity and culture as one of their research questions and commented on the differences between American and Japanese women or American and Korean women (Tanihuchi & Lee, 2012; Lee, Lee, Choi, Kin & Han, 2014; Lee, Taniguchi, Modica & Park, 2013).

Finally, sample size was highly variable amongst the studies. The largest sample size was  $N=1087$  and the smallest was  $N=84$ . The smallest samples were found in studies with experimental designs, seemingly due to the feasibility of recruiting larger samples when using a questionnaire design.

Table 1: Summary of studies included in review

Author/ date	Sample characteristics	Sample size	Data collection method /design	Construct for social media	Constructs for ED symptomology/ body image	Key findings	Key limitations
Ferguson, Munoz, Garza & Galindo (2014)	Female, aged 10-17, mean age 14.11 years American Predominantly Hispanic	N=237	Correlational /survey	Social media use (own scale)	Body image dissatisfaction Eating disorder symptoms	-Peer competition predicted negative outcomes on body image or eating disorder symptoms. -Social media use had small predictive relationship with peer competition.	-Correlational design, no causal inferences can be made. -Convenience sample limited diversity in SES and ethnicity. -Cross sectional design, no information on change over time.
Haferkamp & Kramer (2011) Study 1	Male and female, mean 22.53 years	N=91	Online experiment	Virtual online profiles which were manipulated	Body image	-Participants that viewed 'attractive' profile pictures had less positive emotions, and greater discrepancy between their build and an ideal build than participants that viewed 'unattractive' profile pictures.	-Unclear if result is particular to social networking sites. -Threat to ecological validity
Hummel & Smith (2014)	Primarily female (78%) Mean age 18.73 American	N=185	Correlational /survey	Analysis of Facebook status updates and comments posted by participants	Eating disorder symptoms	-Participants who received extremely negative comments on personally revealing	-Researcher bias -Measure of negative feedback seeking style not validated.

Author/ date	Sample characteristics	Sample size	Data collection method /design	Construct for social media	Constructs for ED symptomology/ body image	Key findings	Key limitations
	Predominantly Caucasian					status updates were more likely to report higher shape, weight or eating concerns.	
Lee, Lee, Choi, Kim & Han (2014)	Male and female, mean age 21.13 years, undergraduate students 502 Americans 518 Koreans	N=1020	Correlational /survey	Social media use measure	Body image	-Social media use for self-seeking status positively correlated with body image in Korean sample.	-Correlational design – no causal inferences can be made. -Self-report bias.
Lee, Taniguchi, Modica & Park (2013)	Female, university students 159 American women 137 Korean women	N=296	2x2 between subject design experimental	Mock-up Facebook profile with pos/neg comments and different pictures	Body satisfaction	-Significant cultural difference in impact on 'fat talker's' body size on body satisfaction. US sample not affected by size of 'fat talker', Korean sample reported significantly lower body satisfaction when exposed to a 'fat talker' who was thin.	-Threat to ecological validity. -Photograph used may be biased towards Korean participants.
Mabe, Forney &	Female college students	N=960	Correlational /survey	Duration of Facebook use	Eating Attitudes	-Small but significant positive correlation found between	-Correlational design, no causal inferences can be made.

<b>Author/ date</b>	<b>Sample characteristics</b>	<b>Sample size</b>	<b>Data collection method /design</b>	<b>Construct for social media</b>	<b>Constructs for ED symptomology/ body image</b>	<b>Key findings</b>	<b>Key limitations</b>
Keel (2014) [study 1]	Mean age 19.10 years					duration of Facebook use and disordered eating.	-Does not investigate specific factors which may account for association. -Self-report bias. -Cross sectional design, no information on change over time.
Mabe, Forney & Keel (2014) [study 2]	Female college students Mean age 19.10 years American	N=84	Online experiment with control group	Facebook Survey questions	Eating Attitudes VAS measures of preoccupation with weight, shape and urge to exercise	-Higher EAT-26 scores significantly associated with certain Facebook features (receiving comments on status, 'un-tagging' photos, comparison of photos). -Participants not exposed to Facebook showed greater decline in preoccupation with weight and shape.	-Threat to ecological validity. -Cross sectional design, no information on change over time.
Meier & Gray (2014)	Female, aged 12-18, mean age 15.4, High school students American	N=103	Correlational /survey	Total Facebook use Specific Facebook use	Weight dissatisfaction Drive for thinness Thin ideal internalisation	-No significant associations found between total Facebook use and body image variables.	-Correlational design, no causal inferences can be made. -Self-report bias.

Author/ date	Sample characteristics	Sample size	Data collection method /design	Construct for social media	Constructs for ED symptomology/ body image	Key findings	Key limitations
	Predominantly white				Appearance comparison Self- objectification	-‘Facebook appearance exposure’ significantly positively correlated with internalization of thin ideal, self- objectification and drive for thinness and negatively correlated with weight satisfaction.	-Small sample, limited diversity in SES and ethnicity.
Smith, Hames & Joiner (2013)	Female American university students Predominantly caucasian	N=232	Longitudinal/ survey	Maladaptive Facebook use	Bulimic symptoms Body dissatisfaction Shape concern	-Maladaptive Facebook use significantly predicted increases in bulimic symptoms and episodes of overeating 4 weeks later. -Body dissatisfaction fully mediated relationship between maladaptive Facebook use and increases in overeating and partially mediated relationship for bulimic symptoms.	-Unclear if the findings are unique to social media. -Measures of ‘maladaptive Facebook usage’ not extensively validated.
Taniguchi & Lee (2012)	Female college students 96 Americans	N=199	Online experiment using 2x2	Facebook usage (using Facebook Intensity Scale)	Body satisfaction	-Japanese sample reported significantly lower body	-Weak manipulation of study as participants only

<b>Author/ date</b>	<b>Sample characteristics</b>	<b>Sample size</b>	<b>Data collection method /design</b>	<b>Construct for social media</b>	<b>Constructs for ED symptomology/ body image</b>	<b>Key findings</b>	<b>Key limitations</b>
	103 Japanese		between subject design			satisfaction when witnessing messages encouraging weight loss rather than discouraging weight loss. This was not found in the US sample.	exposed to 1 profile owner. -No manipulation check on messages encouraging/discoura ging weight loss. -Cross sectional design, no information on change over time.
Tiggeman & Miller (2010)	Female, mean age 14.9 years, Australian High School students Predominantly white	N=156	Correlational /survey	Internet exposure measure including frequency of time spent on internet (specifically in relation to MySpace, Facebook, Bebo, Friendster, Ringo and other)	Internalisation of thin ideal Appearance comparison Weight satisfaction Drive for thinness	-Internet exposure negatively correlated with 'weight satisfaction' and positively correlated with 'drive for thinness'. -More time spent on social networking sites associated with increased 'drive for thinness', increased 'internalization of thin ideal' and decreased 'weight satisfaction'.	-Correlational design, no causal inferences can be made. -Does not investigate specific factors which may account for association. Self-report bias. -Convenience sample, limited diversity in SES and ethnicity. -Cross sectional design, no information on change over time.
Tiggemann & Slater (2013)(a)	Female, aged 10-12 years, Australian	N=189	Correlational /survey	Internet exposure measure including frequency of time spent on internet (specifically	Internalisation of thin ideal Body surveillance	-Internet exposure significantly correlated with all measures of body image.	-Correlational design, no causal inferences can be made.

<b>Author/ date</b>	<b>Sample characteristics</b>	<b>Sample size</b>	<b>Data collection method /design</b>	<b>Construct for social media</b>	<b>Constructs for ED symptomology/ body image</b>	<b>Key findings</b>	<b>Key limitations</b>
	Primary School students			in relation to MySpace and Facebook)	Body esteem Dieting	-Time spent on social networking sites positively correlated with body image disturbance and negatively correlated with body esteem (at a higher rate than total internet exposure). -Facebook users scored significantly higher on body image disturbance and lower scores on body esteem than non-Facebook users.	-Does not investigate specific factors which may account for association. -Self-report bias. -Convenience sample, limited diversity in SES and ethnicity. -Cross sectional design, no information on change over time.
Tiggeman & Slater (2013)	Female, aged 13-15, High school students Australian	N=1087	Correlational /survey	Internet exposure measure including frequency of time spent on internet (specifically in relation to MySpace and Facebook)	Internalisation of beauty ideal Body surveillance Drive for thinness	-Internet exposure significantly correlated with all measures of body image. -Time spent on social networking sites correlated at a higher rate than total internet exposure. -Facebook users scored significantly higher on all measures	-Correlational design, no causal inferences can be made. -Does not investigate specific factors which may account for association. -Self-report bias. -Cross sectional design, no information on change over time.

<b>Author/ date</b>	<b>Sample characteristics</b>	<b>Sample size</b>	<b>Data collection method /design</b>	<b>Construct for social media</b>	<b>Constructs for ED symptomology/ body image</b>	<b>Key findings</b>	<b>Key limitations</b>
						of body image than non-Facebook users.	
Veldhuis, Konijn & Seidell (2014)	Females aged between 11-18 (mean age 14.15 years) High school students Netherlands	N=216	3x3 experimental design	Peer comments manipulated on YouTube	Body dissatisfaction Objectified body consciousness Social comparison with media models Appearance schematicity	-Participants shown 'extremely thin' media model were most dissatisfied with their bodies when peers marked the model as 'just somewhat underweight'. -Participants with higher appearance schematicity had higher levels of body consciousness whilst viewing images and messages online.	-Threat to external validity -Cross sectional design, no information on change over time.

Table 2: Summary of outcome measures found in studies

Authors	ED/body image Measures	Validated (Y/N)	Internal consistency rate	Social media use measures	Validated (Y/N)	Internal consistency rate
Ferguson, Munoz, Garza & Galindo (2013)	<i>Body image - Body Esteem Scale for Adolescents and Adults</i> (Mendelson et al, 2001)	Y	Not stated	Measure of social media use created by authors. A 7 item scale was used to assess the frequency in which participants used various forms of social media.	N	$\alpha=.71$ at both time points
	<i>Eating disorder symptoms - Eating Attitudes Test (EAT-26;</i> Garner et al, 1982)	Y	Not stated	<i>Peer competition</i> was measured using the Female Competition Stress Test (FCST; Salmon, 2008)	N	$\alpha=.91$ and $\alpha=.89$ .
Haferkamp & Kramer (2011)	<i>Emotional state - the PANAS scale</i> (Watson & Clark)	Y	Not stated	N/A due to experimental design		
	<i>Body image – The Body Image scale by Luczak and the Dresden body-image scale.</i>	?	Not stated			

Authors	ED/body image Measures	Validated (Y/N)	Internal consistency rate	Social media use measures	Validated (Y/N)	Internal consistency rate
Hummel & Smith (2014)	<i>Disordered eating attitudes</i> - subscales for restraint, weight concern, shape concern and eating concern from the Eating Disorder Examination Questionnaire (EDEQ-4) (Fairburn & Cooper, 1993)	Y	Not stated	Measure of 'Facebook feedback seeking' - one item from the Maladaptive Facebook Questionnaire used (ref). A coding system was used to rate participants status updates and comments.	Y	Inter-rater reliability for coding system kappa=0.85
Lee, Lee, Choi, Kim & Han (2014)	<i>Body image evaluation - Body-Esteem Scale for Adolescents and Adults</i> (Mendelson, mendelson & White, 2001)	Y	Not stated	Measure of social media use created by the authors. Measured three main functions – information seeking, socializing (interpreted as commenting on other's posts) and self-status seeking. The authors developed these items on the basis of	N	Not stated

Authors	ED/body image Measures	Validated (Y/N)	Internal consistency rate	Social media use measures	Validated (Y/N)	Internal consistency rate
				previous literature and modified some items used in previous studies.		
Lee, Taniguchi, Modica & Park (2013)	<i>Body satisfaction</i> - Body Satisfaction subscale of the Eating Disorder Inventory-3 (Garner, 2004).	Y	Not stated	N/A due to experimental design		
	<i>Self-esteem</i> - (Rosenberg Self Esteem Scale, 1965)	Y	Not stated			
	<i>Psychological well-being</i> - (Ryff, 1989)	Y	Not stated			
Mabe, Forney & Keele (2014) [study 1]	<i>Disordered eating and behaviour</i> - Eating Attitudes Test 26 (EAT-26). This distinguishes between eating	Y	$\alpha=.92$	Measure of 'duration of Facebook use' was created by the researchers. The question 'How much time do you spend on Facebook per week' was asked and a	N	

Authors	ED/body image Measures	Validated (Y/N)	Internal consistency rate	Social media use measures	Validated (Y/N)	Internal consistency rate
	disorder cases and non-cases.			response score was given.		
Mabe, Forney & Keel (2014) [study 2]	VAS – asking preoccupation with weight, shape and urge to exercise ‘right now’.	N	Not stated	<i>Measure of Facebook use</i> –developed by the researchers. Asked how participant’s time was spent on Facebook (e.g. posting, commenting, ‘liking’) and an overall Facebook score was given.	N	$\alpha = .85$ .
	<i>Eating attitudes</i> – Eating Attitudes Test (EAT-6) (Garner et al., 1982)	Y	$\alpha = .91$			
	<i>Anxiety</i> – State Trait Anxiety Inventory (STAI) (Spielberger et al., 1983)	Y	$\alpha = .93$ .			
Meier & Gray (2014)	<i>Weight satisfaction</i> – Weight satisfaction subscale of the Body Esteem Scale for Adolescents and Adults (BES)	Y	$\alpha = .935$	<i>Total internet and Facebook use</i> – Developed by the researchers. Participants asked their typical internet use Facebook from 6 categories ranging from “never/almost	N	Not stated

Authors	ED/body image Measures	Validated (Y/N)	Internal consistency rate	Social media use measures	Validated (Y/N)	Internal consistency rate
	<i>Drive for thinness- Drive for thinness subscale of the Eating Disorders Inventory</i>	Y	$\alpha=.941$	never” to “3+hours a day”.	N	$\alpha=. 874.$
	<i>Self-objectification – Self-objectification questionnaire</i>	Y	Not stated	<i>Facebook appearance related exposure –</i> A 24 item list of Facebook activities was compiled based on a list of popular features published by the Facebook help centre. Items were rated on a 5 point scale to indicate typical use of each feature and an overall score was produced.		
Smith, Hames & Joiner (2013)	<i>Eating disorder pathology - the bulimia and body dissatisfaction subscales from the Eating Disorder Inventory (EDI) (Garner et al. 1983) and the Eating Disorder Examination Questionnaire-4</i>	Y	Not stated	Measure of ‘maladaptive Facebook use’ was created by the authors. This was a 7 item questionnaire focusing on negative social evaluations and social comparisons.	N	$\alpha=.71$

Authors	ED/body image Measures	Validated (Y/N)	Internal consistency rate	Social media use measures	Validated (Y/N)	Internal consistency rate
	(EDEQ-4) (Fairburn & Beglin, 1994).					
Taniguchi & Lee (2012)	<i>Body satisfaction</i> - Body Satisfaction subscale of the Eating Disorder Inventory-3 (Garner, 2004).	Y	Not stated	N/A due to experimental design		
	<i>Self-esteem</i> - (Rosenberg Self Esteem Scale, 1965)	Y	Not stated			
	<i>Psychological well-being</i> - (Ryff, 1989)	Y	Not stated			
Tiggeman & Miller (2010)	<i>Internalization - Sociocultural Internalization of Appearance Questionnaire-Adolescents</i> (Kerry et al. 2004).	Y	$\alpha=.88$	Measure of 'media exposure' developed by the researchers. Rated by a convenience sample of 3 people to give a total appearance exposure score.	N	Not stated

<b>Authors</b>	<b>ED/body image Measures</b>	<b>Validated (Y/N)</b>	<b>Internal consistency rate</b>	<b>Social media use measures</b>	<b>Validated (Y/N)</b>	<b>Internal consistency rate</b>
	<i>Appearance comparison – Physical Appearance Comparison Scale (PACS)</i> (Thompson et al. 1991).	Y	$\alpha=.78$	Separate scores given for magazine/television exposure and internet exposure.		
	<i>Weight satisfaction – Weight Satisfaction subscale of the Body-Esteem Scale for Adolescents and Adults</i> (Mendelson et al. 2001).	Y	$\alpha=.93$			
	<i>Drive for thinness – Drive for Thinness subscale of the Eating Disorder Inventory (EDI; Garner et al. 1983).</i>	Y	$\alpha=.92.$			

Authors	ED/body image Measures	Validated (Y/N)	Internal consistency rate	Social media use measures	Validated (Y/N)	Internal consistency rate
Tiggeman & Slater (2013)	<i>Internalization of beauty ideals</i> – 3 items from the Sociocultural Attitudes towards Appearance Questionnaire (Heinberg et al 1995).	Y	Not stated	Measure of ‘internet exposure’ developed by the researchers. This asked participants to report on frequency of internet use each day and their 3 favourite websites. Further questions were asked about Facebook and MySpace use including number of friends and whether their profile was public or private.	N	Not stated
	<i>Body surveillance</i> – Objectified Body Conscious Scale – Youth (Lindberg et al. 2006)	Y	Not stated			
	<i>Drive for thinness</i> – Drive for Thinness subscale of the Eating Disorder Inventory (EDI; Garner et al. 1983).	Y	Not stated			
Tiggeman & Slater (2013) (a)	<i>Internalization - Sociocultural Internalization of Media Ideals</i>	Y	$\alpha=.78$ which was improved to $\alpha=.85$ when 1 item was removed.	Measure of ‘media exposure’ developed by the researchers. Rated by a convenience sample	N	Not stated

Authors	ED/body image Measures	Validated (Y/N)	Internal consistency rate	Social media use measures	Validated (Y/N)	Internal consistency rate
	Scale (Jones et al. 2004).			of 3 people to give a total appearance exposure score.		
	<i>Body surveillance</i> – Body surveillance Scale of the Objectified Body Conscious Scale (Lindberg et al. 2006)	Y	$\alpha=.85$ .	Separate scores given for magazine/television exposure and internet exposure.		
	<i>Body esteem</i> – Body Esteem Scale for Children (Mendelson & White, 1993).	Y	$\alpha=.93$ .			
	<i>Dieting</i> – 3 questions were used to ask about dieting behaviour and status.	Y	$\alpha=.52$			
Veldhuis, Konijn & Seidell (2014)	<i>Body dissatisfaction</i> - (Gaerner et al, 1983)	Y	Not stated	N/A due to experimental design		

<b>Authors</b>	<b>ED/body image Measures</b>	<b>Validated (Y/N)</b>	<b>Internal consistency rate</b>	<b>Social media use measures</b>	<b>Validated (Y/N)</b>	<b>Internal consistency rate</b>
	<i>Objectified body consciousness –</i> (Lindberg et al, 2006)	Y	Not stated			
	<i>Social comparison -</i> (heinberg et al, 1995)	Y	Not stated			
	<i>Appearance schematicity -</i> (Cash & Labarge, 1996)	Y	Not stated			

**1) Is social media use associated with body image disturbance or eating disorder symptomology?<sup>1</sup>**

Tiggeman & Miller (2010) investigated adolescent females' use of the internet to determine its relationship with weight satisfaction and drive for thinness. This association was compared with more traditional forms of media such as television and magazines. They conducted the study within a socio-cultural theoretical framework which proposed that media effects on body image are mediated by internalization of the thin ideal and appearance comparison.

Their sample, 156 female high school students aged between 13 and 18, were asked to complete questionnaires which asked about their exposure to media and eating disorder symptomology.

This study found that internet exposure was the only medium correlated with weight satisfaction ( $R = -.17^*$ ). Overall, internet exposure was negatively correlated with weight satisfaction and positively correlated with drive for thinness ( $R = .32^{**}$ ). In addition, specific websites were explored in further detail. Results showed that more time spent on Facebook and MySpace (both social networking sites) was associated with increased drive for thinness ( $R = .24^{**}$  Facebook,  $R = .22^{**}$  MySpace). Time spent on Facebook was also associated with increased internalization of thin ideal ( $R = .18^*$ ) and decreased weight satisfaction ( $R = -.20^*$ ). No other websites has such associations.

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<sup>1</sup> When noting significance  $p < .05$  \*,  $p < .01$  \*\*,  $p < .001$  \*\*\*

A further regression analysis indicated that internalization of thin ideal and appearance comparison completely mediate the effect of Internet appearance exposure on weight satisfaction and partially mediate the effect on drive for thinness. This provides evidence in support of the socio-cultural theoretical framework.

Whilst this study shows a solid association between social media and body image there are a number of limitations. Firstly whilst there may be an association, it does not tell us the specific aspects of social media which may be responsible for the association. In addition, there are a number of potential biases in the use of self-report data. In particular participants may have been subject to social desirability bias as they were asked to complete the questionnaire in their classroom at school. The measures used to operationalise body image variables were standardised and had been checked for internal consistency. However, the measures used to operationalise media exposure did not have valid inter-rater reliability and had not been used with any other sample. Results may also be limited due to a convenience sample being used which limited diversity in social economic status and ethnicity. Finally, as the results were correlational no causal inferences can be made. In particular, it is not clear whether high levels of drive for thinness and weight satisfaction lead to more use of social networking or vice versa.

Tiggemann & Slater (2013) aimed to replicate Tiggemann & Miller (2010) but in a younger sample. Their key hypothesis was that amount of internet exposure would be positively correlated with body image concerns in 10-12 year old girls.

Their sample, 189 females aged between 10 and 12, were recruited from 8 Catholic Primary schools in Southern Australia. They were asked to complete questionnaires which asked

about their exposure to media and eating disorder symptomatology, similarly to Tiggeman & Miller (2010).

The study found that internet exposure was significantly correlated with all four measures of body image. In terms of social networking sites, time spent on MySpace and Facebook had stronger positive associations with Internalization of thin ideal ( $R=.32^{***}$ ), Body surveillance ( $R=.34^{***}$ ) and Dieting behaviour ( $R=.31^{***}$ ) and negative associations with body esteem ( $R=-.27^{***}$ ) than total internet exposure. In addition, Facebook users showed significantly higher scores on body image disturbance and lower scores on body esteem than non-Facebook users. Number of Facebook friends was also significantly correlated with dieting.

Further regression analysis showed that the relationships between internet exposure and body esteem and dieting were fully mediated by internalization of the thin ideal, again providing evidence for the socio-cultural model.

This study extended previous literature to investigate preteen girls' body image in relation to internet use and replicated Tiggemann & Miller's (2010) findings in a younger group. This study produced larger effect sizes than the previous one. However, whilst this may support findings in both studies, the same limitations as discussed in relation to Tiggemann & Miller (2010) apply.

In order to add to findings from the previous studies, Tiggemann & Slater (2013) conducted a follow up study to Tiggemann & Miller (2010). The authors aimed to replicate this study, but focused solely on internet exposure, with a larger and more diverse sample. The key prediction was that amount of internet exposure would be positively correlated with body image concerns, as would Facebook use.

Their sample, 1087 female high school students aged between 13 and 15, were asked to complete questionnaires which asked about their exposure to media and eating disorder symptomatology.

Results showed internet exposure to be significantly correlated with each of the body image variables and that time spent on social networking sites Facebook and MySpace had stronger associations (Internalization of thin ideal  $R=.16^{***}$ , Body surveillance  $R=.24^{***}$ , Drive for thinness  $R=.16^{***}$ ). In addition, further examination on Facebook users showed that these participants scored significantly higher on all measures of body image than non-users and number of Facebook friends was significantly positively correlated with all body image variables.

This study allows us to draw more conclusions than the previous study's preliminary results on the association between social networking sites and body image due to a larger and more diverse sample. Participants were recruited from a mixture of 18 schools which were both public and private and therefore a greater range of ethnicity and socio economic status was reported. A positive correlation was found between the number of Facebook friends and body image variables, and the authors note possible links with opportunity for multiple social comparisons, a factor known to be linked to body image. However, although this study may have higher validity than the previous one, it still relies on self-report data and measures of internet exposure which have not been validated. In addition, causality cannot be inferred due to the correlational design.

Mabe, Forney & Keel (2014) aimed to replicate correlations found in previous studies linking Facebook use to increased eating disorder pathology but in a larger sample (in part 1 of their 2 part study).

They asked a sample of 960 female college students to complete a questionnaire assessing amount of time spent on Facebook and eating disorder pathology. 623 participants completed this in the fall and the remaining 334 completed it in the spring.

A small but significant positive correlation was found between duration of Facebook use and disordered eating ( $R=.11^{**}$  in the fall and  $R=.16^{**}$  in the spring), again replicating previous findings.

Strengths of this study are the large sample and use of a measure for disordered eating that has good psychometric quality. However, the limitations of self-report and a cross sectional design (as discussed above) apply.

The authors then went on to utilize an experimental design to make further inferences about causation. Using a sample of 84 women, who used Facebook on a weekly basis, they assigned participants to two groups. The experimental group was asked to spend 20 minutes on their Facebook site and the control group was asked to spend 20 minutes on Wikipedia researching a neutral rainforest animal. Stratified randomization to the experimental and control groups was used to match disordered eating levels between the groups (information taken from the first part of the study). After 20 minutes all participants were asked to complete questionnaires about anxiety, eating attitudes and Facebook use.

The results showed that EAT-26 scores were significantly associated with scores on several items on the Facebook survey. For example, participants with greater disordered eating placed greater importance on receiving comments on their status ( $R=.29^{**}$ ), untagging photos of themselves more often ( $R=.34^{**}$ ) and comparing their photos to others ( $R=.22^*$ ).

In both groups a decrease in preoccupation with weight and shape from before to immediately after spending 20 minutes on the internet was found. However, participants in the control group demonstrated a greater decline than those in the experimental group

( $F=21.29^{***}$ ,  $d=.42$  compared with  $F=4.34^*$ ,  $d=.13$ ). The authors suggest that Facebook use maintains a preoccupation with weight and shape compared to the internet control condition.

Overall this study demonstrates that the way in which individuals use Facebook (reflected in their Facebook score) is associated with greater disordered eating. These participants reported spending more time on Facebook, but also engaged in more appearance focused behaviours such as comparing photos and placing greater importance on the responses elicited by their Facebook content. This is in line with earlier self-report information. The experimental design also indicates that typical Facebook use may contribute to the maintenance of weight and shape concerns (known risk factors for eating disorders) as this was found in 20 minutes of Facebook use.

The study benefited from an experimental design. However, it considers just 20 minutes of Facebook use in a laboratory setting and therefore how much can be inferred about normal Facebook use throughout the day is unclear. In addition, although the experimental design allows inferences to be made about Facebook use compared with another internet activity, this may not generalise to other activities. It is also unclear how much Facebook influences eating disorder risk beyond other social or media influences.

## **2) What are the processes by which social media may influence body image?**

Ferguson, Munoz, Garza & Galindo (2013) examined whether television or social media use would predict body dissatisfaction or eating disorder symptoms beyond the predictive influence of peers. They hypothesised that the influence of both television and social media would diminish when peer effects were controlled and therefore that social media was only influential because of peer effects.

Their sample was 237 females aged between 10 and 17 (mean age 14.11 years). Participants were asked to complete questionnaires. After 6 months follow up data was collected from 101 of the sample where all the same variables were reassessed.

The study used regression analysis and found that only peer competition, rather than television or social media use predicted increased body dissatisfaction ( $\beta=.36^{***}$ ). However, social media use had a small predictive relationship with peer competition, suggesting that social media may be one area in which peer competition is carried out. This indicates possible indirect (rather than direct) effects of social media on body image. Results supported the Catalyst model's inclusion of peer influence as a key variable for the development of body dissatisfaction, and suggests that social media had become an additional arena where peer competition may occur. Neither social media, television exposure or peer competition predicted eating disorder symptoms in this study.

However, the results of this study are limited due to a number of factors. The correlational design means that causal inferences cannot be made. The sample was relatively small and taken from a Hispanic community which may limit the generalisation that can be made to the wider population. In addition, the measures used regarding media exposure were not validated and may not fully capture the information. Whilst the issues of self-report bias are present the authors did ask for parental responses, as well as child responses, to reduce potential single responder bias effects.

Veldhuis, Konijn & Seidell (2014) also investigated how peer influence can negotiate media influences on adolescent female body dissatisfaction. They examined the thin-body ideal as portrayed in media and peers feedback on such images (and how this influences body image) using a YouTube format which integrated peer comments and media models as if they were

an original full colour screen shot of a YouTube clip. The authors systematically combined peer and media influences in an experimental 3x3x3 design with the following conditions:

Media model body shape - 1) extremely thin, 2) thin, 3) normal weight (images were used that had been pretested in a previous study).

Peer comments – text accompanying the model claiming them to be either 1) underweight by 6kg i.e. extremely thin, 2) underweight by 3kg i.e. thin, 3) normal weight

The three types of body shape and peer comments were systematically combined to form 9 YouTube pages.

The researchers used a sample of 216 adolescent girls randomly selected from secondary schools in both urban and rural parts of the Netherlands. Participants were randomly selected into one of the three conditions and then asked to fill in a questionnaire.

Results showed that adolescent girls who were confronted with an extremely thin media model were most dissatisfied with their bodies when peers marked this model to be just somewhat underweight (by 3kg). The authors described this as an ‘idealization effect’ meaning that when peers feedback on an extremely thin body suggests this body is just somewhat underweight, it becomes a reachable goal because many girls want to lose weight. They also found that girls with higher appearance schematicity had higher levels of body consciousness when the above takes place, thus indicating that people with pre-existing body concerns may be most vulnerable.

The strengths of this study lie in its experimental design which allowed for causal inferences to be made. The systematically combined media and peer influence, and use of YouTube format, used in the experiment adds to the ecological validity. However, the peers used were simulated and therefore different results may have been found in real life peers. In addition,

the mock up YouTube pages were only viewed for a short time and therefore cannot inform us about social media influences of this nature over time.

Smith, Hames & Joiner (2013) assessed whether 'maladaptive' Facebook use (defined as the tendency to engage in social comparison and elicit negative social evaluations on Facebook) predicted increases in bulimic symptoms, and whether body dissatisfaction mediated this relationship. They used the interpersonal formulation of eating disorders (Reiger et al. 2006), which posits that individuals engage in disordered eating in response to negative social interactions in an attempt to assuage negative feedback and boost self-esteem, to inform their thinking.

This study had a longitudinal design. Their sample, 232 female undergraduate students, were asked to complete questionnaires on two separate occasions (4 weeks apart) which asked about their Facebook use and eating disorder symptoms.

A hierarchical linear regression model was used and results showed that maladaptive Facebook use significantly predicted increases in bulimic symptoms and episodes of over eating approximately four weeks later ( $\beta=.13^{**}$ ,  $sr=.18$ ). Maladaptive Facebook use also predicted increased body dissatisfaction on the EDI ( $\beta=.21^{**}$ ,  $sr=.20$ ) and the EDEQ-4 ( $\beta=.03^{**}$ ,  $sr=.17$ ). Body dissatisfaction was found to fully mediate the relationship between maladaptive Facebook use and increases in over eating and partially mediate the relationship for bulimic symptoms. The authors noted the findings from their study to be consistent with the interpersonal formulation of eating disorders.

The main strength of this study lies in the longitudinal design which allowed for the associations to be examined over time. In addition, the study made use of well validated

measures across multiple dependent variables (two measures of body dissatisfaction and also a behavioural measure of bulimia nervosa symptoms).

In terms of limitations, the measure of ‘maladaptive Facebook usage’, despite showing good psychometric properties, had not been extensively validated. In addition, although this study explores a specific feature of social media use (social comparison tendencies and negative social evaluations) it does not assess these outside of a social networking context and therefore it is unclear whether these features are unique to social media. It also only investigates one social networking site and therefore cannot draw conclusions about social media as a whole.

Meier & Gray (2014) aimed to expand on Tiggemann & Miller’s (2010) study by identifying specific features of Facebook usage that are associated with body image disturbance. They stated that measuring the total time spent on Facebook does not account for the diverse array of features and tools and therefore is uninformative. Meier & Gray measured ‘Facebook appearance exposure’ which they defined as ‘user activity dedicated to photos’ in comparison with overall use. They hypothesised that higher total Facebook use would correlate with higher body image disturbance and that higher Facebook appearance exposure relative to overall Facebook use would correlate with higher body image disturbance.

Their sample, 103 female students between the ages of 12-18, were asked to complete a survey during a free period which asked about their Facebook use and body image.

This study found ‘Facebook appearance exposure’ to be positively correlated with internalization of thin ideal ( $R=.358^{**}$ ), self-objectification ( $R=.286^{**}$ ) and drive for thinness ( $R=.271^{**}$ ) and negatively correlated with weight satisfaction ( $R=-.227^{*}$ ).

Interestingly no significant correlations were found between total Facebook use and any of

the body image variables. This is contrary to Tiggemann & Miller's findings and may indicate that specific features of Facebook use (such as photos) are responsible for their findings. However, this could also be due to other factors such as sampling differences. The results suggest that it is not the amount of time spent on Facebook per se which is important, but the specific activity that is linked with body image disturbance. Findings from this study regarding photo sharing, may be explicable in terms of Self-objectification and Peer Influence theories.

In terms of limitations, this study is correlational and therefore assumptions about causality cannot be made. There are also limitations in terms of self-report data being subject to recall bias and social desirability factors. Whilst the sample may be somewhat representative of the group most likely to be at risk of developing eating disorders, it was relatively small and not diverse in terms of socio-economic status and ethnicity.

Hummel & Smith (2014) noted that a limitation of previous research was that specific types of Facebook usage, particularly the content of status updates and comments, had not been examined. They aimed to extend research by questioning whether 1) the desire of feedback and amount of negative feedback received on Facebook predicts disordered eating attitudes 2) the nature of self-disclosure and comments received predict disordered eating attitudes. Using a sample of 185 predominantly female students (mean age 18.73 years) they asked participants to complete questionnaires on two separate occasions approximately four weeks apart. Additionally, at the first time point researchers gained access to participants' Facebook accounts so that they could record status updates and comments received during the four week period of the study.

This study found that feedback seeking predicted eating restraint when the number of comments received was high ( $\beta=0.32^*$ ,  $t=2.47$ ). No significant associations were found

between feedback seeking and number of comments received in predicting eating concerns, shape concerns or weight concerns. However, individuals who received extremely negative comments on personally revealing status updates were more likely to report shape concerns, eating concerns and weight concerns at the second time-point ( $\beta=0.02^*$ ,  $t=2.39$ ). Overall it appears that when an individual desires feedback and receives a high amount of feedback, eating, shape or weight concerns are not affected. However, individuals who receive highly negative comments in response to personally revealing status updates are more likely to report higher shape, weight or eating concerns. This is consistent with the interpersonal formulation of eating disorders.

The strengths of this study lie in its longitudinal design, which allowed for change to be detected over time, and its non-reliance on purely self-report data. The researcher's analysis of direct content from participants Facebook accounts removed the bias of self-report and made the study more objective. However, this could still be subject to bias of the researchers' interpretation of the status updates and comments. In addition, this study went beyond a number of other studies by examining a specific feature of Facebook use.

In terms of limitations, the authors note that the identity of the individuals making the comments is unknown. Therefore it is possible that participants commented on their own statuses or that a single individual commented multiple times which could have inflated the figures. It is unclear how reliable the measure of negative feedback seeking style was as only one item from the Maladaptive Facebook Usage Scale was used (and this measure in itself is not well validated).

Lee, Lee, Choi, Kim & Han (2014) explored the similarities and differences in the relationships between three features of social media use and body satisfaction and psychological wellbeing in different cultures, comparing Koreans and US Americans. The

three features were: i) information, ii) self-seeking status, which is the desire to seek and maintain one's personal status through social media use to develop one's career or to feel influential iii) socialising.

Their sample of 1020 undergraduate participants (502 Americans and 518 Koreans) were recruited from universities in the respective countries. All participants were asked to complete an online questionnaire.

The relevant finding for the purposes of this review is that while social media use for self-seeking status is not related to body image in the USA, it is positively related to body image in Korea ( $\beta=.15^{**}$ ,  $t=2.60$ ) i.e. those who actively posted messages and pictures had a better body image than those that did not. This is contrary to many other studies.

Strengths of this study are that it explores cultural differences, an area missing from much of the literature on this topic, and that it has a large sample size. However, there are several limitations. The biases of self-report measures apply, the measure of social media use may not be reliable, and the cross sectional nature of the study means that causation cannot be inferred.

Haferkamp & Kramer (2011) hypothesised that people who look at profile pictures of attractive users on social networking sites are likely to have a more negative emotional state afterwards and to be more dissatisfied with their physical appearance than people who look at unattractive profile pictures.

Using a between subjects design, a sample of 91 participants (mean age 22.53 years) were confronted with different fictitious online profiles. Participants were randomly selected to groups. One group looked at profile pictures of 'attractive' users whereas the other group looked at profiles of 'unattractive' users. They were then asked to complete a number of questionnaires asking about mood and body image. In order to determine 'attractiveness' of

the profile pictures, the photographs of users were taken from [www.hotornot.com](http://www.hotornot.com) (a website where people upload photographs and other people rate their attractiveness). In addition, 25 female and 25 male participants were asked to evaluate the attractiveness of some randomly selected users and the four males and females rated most attractive or unattractive were selected.

Results revealed a significant main effect for 'positive emotions' ( $F = 4.27^*$ ) in relation to viewing profile pictures. This suggests that participants who looked at attractive profile pictures (females looking at pictures of women and males looking at pictures of men) had less positive emotions than those who looked at the less attractive profiles. Participants who looked at attractive users also stated a greater discrepancy between their build and an ideal build, which was revealed in the main effect 'real build discrepancy' ( $F=32.11^{***}$ ). These results may be understood in relation to social comparison theory as when looking at 'more attractive' others it seems participants compared themselves and felt lower in mood or more dissatisfied with their own bodies.

The strengths of this study lie in its experimental design. The groups of participants were randomly allocated to the different conditions and valid measures were used to measure effect on body image. A manipulation check was also carried out to check whether the experimental manipulation produced the expected psychological effect. An ANOVA revealed a significant main effect when participants rated attractiveness (suggesting that the objectively more attractive users were rated more attractively).

In terms of weaknesses, it is not clear whether this effect is particular to social networking sites or whether this may happen on other forms of media as well. It may also not translate well to a real life use of social media as people are likely to know the people behind the profile pictures and this could affect how they view attractiveness. However, if the results

were shown to extend beyond profile pictures (i.e. to all the photo sharing that happens on social networking sites) this would be a concerning result.

Taniguchi & Lee (2012) examined how the way in which witnessing ‘fat talk’ on Facebook affects individuals’ body satisfaction and psychological wellbeing and investigated cultural differences between American and Japanese women. ‘Fat talk’ is defined as ‘conversation with others including positive and negative comments about appearance, dieting techniques and the need to lose weight’ (Cordero & White, 2008).

Their sample consisted of 96 US American (mean age 21.02) and 103 Japanese (mean age 19.86) female undergraduates.

A 2 (national culture: American and Korean) x 2 (body size of fat talker: underweight and overweight) x 2 (peers comments: promoting and discouraging weight loss) was used.

Participants initially completed a short survey and were then randomly assigned to one of four screen shots of a Facebook profile mock up.

The results showed that levels of body dissatisfaction and psychological wellbeing did not differ between those who witnessed images of an underweight or overweight profile owner.

This is inconsistent with previous studies which have found that individuals have reported higher body dissatisfaction after being exposed to thin media images than average size or plus size models. However, the study suggested that there is a cultural difference between American and Japanese women regarding the effects of other people’s messages and comments. A significant interaction effect was found between culture and message ( $F=4.92^*$ ,  $\eta^2=.03$ ). The Japanese sample reported significantly lower body satisfaction when they witnessed messages encouraging weight loss ( $M=2.17$ ,  $SD=0.80$ ) rather than discouraging weight loss ( $M=2.58$ ,  $SD=0.72$ ). However the American sample were not affected by this.

It seems overall that ‘fat talk’ i.e. what is being said about the profile owner was more influential than the size of the profile owner in isolation. This could provide evidence for Peer Influence and Social Comparison theories. However, this was only observed in the Japanese sample.

The authors state their unexpected finding could be due to participants only being exposed to a single profile owner. There was also no manipulation check on messages encouraging or discouraging weight loss and it is therefore possible that participants could have interpreted the messages differently. Another weakness is that the study only examined the influence of body related messages made by Facebook friends. The influence of these messages may depend on who posted them. The cultural differences found could be explained by differing internal and external frames of references in the different cultures.

Lee, Taniguchi, Modica & Park (2013) replicated the above study and examined the way in which witnessing ‘fat talk’ on Facebook influenced the body satisfaction and psychological wellbeing of Korean and US American females.

Their sample consisted of 159 US American (mean age 20.59) and 137 Korean (mean age 20.57) female undergraduates.

A 2 (national culture: American and Korean) x 2 (body size of fat talker: underweight and overweight) x 2 (peers comments: promoting and discouraging weight loss) was used.

Participants initially completed a short survey and were then randomly assigned to one of four screen shots of a Facebook profile mock up.

The study found a significant cultural difference in terms of the impact of the fat talker’s body size over participant’s body satisfaction. The American participants were not affected by the size of the fat talker, where as for the Korean participants significantly lower body

satisfaction was reported when they were exposed to a fat talker who was underweight ( $M=2.33$ ,  $SD=0.50$ ), compared with a fat talker who was overweight ( $M=3.06$ ,  $SD=0.38$ ). The authors noted this could be explained by a cultural difference in social comparison tendencies. Another finding from this study was that there were cultural differences in terms of how the content of others messages affects psychological wellbeing. The Korean participants reported a lower level of psychological wellbeing after witnessing thin promoting messages compared with witnessing thin discouraging comments. This was not found to impact on the American group. Overall the authors suggest that Koreans are more influenced by others appearance related messages than their American counterparts.

The experimental design of this study allows for causal effects to be inferred. The authors suggest that because witnessing fat talk on Facebook had an effect despite the brevity of the exposure in the experiment, in real life individuals are more likely to be exposed to fat talk over social media more frequently and for longer and therefore the effects may be greater. This study also showed that the content and context of fat talk is important as some women found the thin discouraging messages to have a positive influence on psychological wellbeing.

In terms of limitations, it is not possible to know if participants found the comments genuine. In addition, the photograph used is of an Asian woman. According to social comparison theory people compare themselves with people they deem to be similar to themselves. It is therefore possible that Korean participants (or American participants of Asian ethnicity, 42.8% of the American sample) might have been more influenced by the pictures than non-Asian participants.

## Discussion

This review aimed to explore the current research on social media and body image. It focused on two main questions:

1) Is social media use associated with body image disturbance or eating disorder psychopathology?

2) If so, what are the processes by which social media may influence body image or psychopathology?

In answer to question 1, the first four studies in this review showed significant associations between time spent on social networking sites (beyond normal internet exposure) and risk factors for ED psychopathology such as body image concerns or body dissatisfaction. Two studies replicated findings from one of the previous studies in larger samples, thus demonstrating the validity of the initial findings. However, whilst these associations were significant, effect sizes were relatively small which must be taken into account when considering 'real life' impact and it is not possible to state the direction of any effect. In addition, the remainder of the studies, with one exception, found associations between particular elements of social media use and body image concerns.

Question 2 went on to consider how social media may be influencing body image and ED psychopathology. Specific features of social networking (such as sharing photos and commenting) were explored, along with some theories to provide an understanding of the psychological mechanisms behind the features (such as theories of social comparison or peer influence).

The main features of social networking explored in the papers reviewed were the use of photo sharing and commenting or giving and receiving feedback. Three studies (Meier & Gray, 2014; Haferkamp & Kramer, 2011; Mabe, Forney & Keel, 2014) examined the use of photo sharing on social networking sites. Meier & Gray (2014) found user activity dedicated to photos on Facebook to be significantly associated with body image concerns over and above total Facebook use. Haferkamp & Kramer (2011) found looking at photos of ‘attractive’ profile owners was associated with less positive emotions and higher body satisfaction. Mabe, Forney & Keel (2014) found that participants with greater disordered eating places greater importance on comparing their photos to others and ‘untagging’ photos of themselves. Social Comparison theory may provide a reason for why photo sharing is associated with body image concerns. This theory suggests that individuals have an innate motivation to evaluate themselves, in comparison to those around them (Festinger, 1954). Looking at photos of others on social networking sites provides ample opportunity for this to occur. Another way to understand the influence of photo sharing may be through Self-objectification theory which states that females come to view their bodies as objects to be looked at, much as an observer would (Perloff, 2014). It seems that self-censoring photos in this way fits with Perloff’s ideas about having an observer’s perspective on one’s own body which can lead to body surveillance, and in turn to body image concerns.

Six papers (Hummel & Smith, 2014; Veldhuis, Konijn & Seidell, 2014; Mabe, Forney & Keel, 2014; Taniguchi & Lee, 2012; Lee, Taniguchi, Modica & Park 2013; Smith, Hames & Joiner, 2013) examined the feature of commenting and giving/receiving feedback. Mabe, Forney & Keel (2014) found that participants with greater disordered eating placed greater importance on receiving comments on their status. Hummel & Smith (2014) found that individuals that receive negative comments on personally revealing status updates were more likely to report body image concerns. Smith et al. (2013) found that ‘maladaptive Facebook

use' (defined as engaging in social comparison and eliciting negative social evaluations) significantly predicted increases in bulimic symptoms and over eating. These findings may be best understood in relation to the Interpersonal Formulation of eating disorders (Rieger et al, 2010). This states that individuals engage in disordered eating in response to negative social interactions in an attempt to lessen the effect of negative feedback and boost self-esteem. However, this often exacerbates the problem and results in more disordered eating. It is difficult to know how much individual differences and pre-existing vulnerability contribute here. Veldhuis et al. found that individuals with higher appearance schematicity had higher levels of body consciousness when using features of social media, therefore suggesting that people with pre-existing body concerns may be most vulnerable. This may fit with a model Perloff (2014) has put forward which suggests that social media is not causing body image concerns, but that social media intervenes between individual differences and behavioural outcomes. However, individual differences, or vulnerability/risk factors to developing an eating disorder, were only examined in one study.

The remaining studies which explored commenting and feedback were more focused on 'fat talk'. Veldhuis et al. (2014) described an 'idealization effect' as they found that participants were most dissatisfied with their bodies when comments from peers suggested an extremely underweight person was just somewhat underweight. It seems that these comments turn being that underweight into a 'reachable' goal. Taniguchi & Lee (2012) found in their Japanese sample that individuals receiving messages encouraging weight loss, rather than discouraging it, reported lower body satisfaction. Lee et al. (2013) found that the size of the person commenting had an impact on their Korean sample (i.e. when the 'fat talker' was thin they reported lower body satisfaction). The authors note that Korean participants may be more influenced by others appearance related messages as they are from a collectivist culture and therefore more likely to evaluate themselves based on external reference, where as US

participants from a more individualistic culture may evaluate themselves based on more of an internal frame of reference. Social Information Processing theory may be relevant here as individuals adapt their beliefs and attitudes in accordance with the comments they are witnessing (Salancik & Pfeffer, 1978). Perloff (2014) noted that a state of ‘normative discontent’ can be developed by individuals and a new context for how we view our bodies can be developed on social media.

Peer influence is another area relevant to all the studies focusing on comments and feedback. Ferguson et al. (2014) found that social media had a small predictive relationship with peer competition which suggests that social media is a place where peer competition is carried out. One way this is done may be via comments.

In addition, some evidence was found in support of the Socio-cultural theory in Tiggeman & Miller (2010) and Tiggeman & Slater (2013, 2013a) as these studies found that internalization of thin ideal and appearance comparison to mediate the association between social media and body image concerns.

In relation to Turner’s (2014) argument about the positive effects of social media, only one study reported a positive finding. Lee, et al. (2014) found in their Korean sample that those who actively posted messages and pictures had a better body image than those who did not. This was at odds with all other findings in the review. However, this could be due to cultural differences (particularly in relation to differing internal and external frames of reference in different cultures as discussed above).

### **Weaknesses of the search strategy**

The search strategy of this review may have led to biases. Firstly not every available database was searched, in particular, dissertation abstracts and grey literature were not searched and

the search was limited to papers written in English. Social media is a relatively new area for research. There is not much literature available, particularly in relation to body image and ED psychopathology, and some of the newest articles were not available. In addition, whilst one study showed social media to have a positive impact, it is possible that this type of result is less likely to be submitted for publication, given the media concern about the potential negative impact of social media, and therefore biases the findings.

Given the small number of studies, exclusion criteria were not based on study methodology and therefore studies used a variety of designs. This made it more difficult to group or compare outcomes and increases the risk of non-methodologically sound results, therefore reducing the confidence in the conclusions drawn.

### **Limitations of studies**

This review is limited by the methodological quality of some of the studies. All the studies were non-clinical populations and therefore do not allow for comment on whether use of social media increases the severity of an existing ED or impedes recovery. Most of the studies were cross sectional in design, meaning there is no follow up data, and the majority relied on self-report data. Whilst some of the self-report studies had large sample sizes, the experimental studies all had relatively small samples. Another key methodological weakness found in many of the studies is the correlational design. These studies do not allow for causality to be inferred and therefore the issue of bio-directionality must be explored. It is possible that a bio-directional relationship is happening whereby individuals with high body image disturbance are driven to interact more heavily with certain features of social media use, and this frequent appearance-related activity acts to reinforce or exacerbate existing body image issues (Meier & Gray, 2014). It is also possible that individuals with high body image disturbance may be driven to use social media for reasons of excessive social comparison (as

is often seen in ED) which would be a unidirectional effect but in the opposite direction to that which we might expect. Therefore the question remains unanswered as to whether social media creates, maintains or merely exacerbates body image concerns.

In addition, due to non-clinical samples and the design of the majority of the studies it was not possible to use a validated methodological checklist when considering validity. However, this review incorporated detailed analysis of the methodological quality of the studies discussed.

Finally, it is not possible for this review to make claims about social media in relation to the development of an eating disorder as the majority of papers did not measure ED symptomology directly. However, all the papers examined known risk factors for developing an ED (such as body image disturbance, drive for thinness etc.) which may then go on to influence a person's eating. Given their relatively low base rate, large longitudinal studies would be needed to determine whether use of social media does increase the risk of developing an eating disorder over time.

### **Implications for future research**

Research in this area is still relatively new. Initial studies which have been reviewed here give us some tentative ideas about the associations between social media and body image and ED psychopathology. However, experimental designs that can take initial correlational findings further to identify causation would add enormous value. It would be important that these studies were kept as 'real world' and as limited in potential bias as possible, for example using randomised control designs in a non-lab setting. It would also be important for the concepts and specific features of social media use to be operationalised appropriately to ensure the correct concepts are measured. In addition, large scale, naturalistic designs would also be beneficial in order to improve the external validity of future research.

More evidence is needed to determine which aspects of social media are responsible for the association with body image concerns and ED psychopathology. A number of studies reviewed identified features such as photo sharing and commenting. However, there were a relatively small number of studies and the sample sizes were small. It would also be beneficial to explore both direct and indirect effects of social media and consider any further mediating factors, such as peer competition, which may be contributing.

Only two studies were longitudinal and therefore this review provides little information on the influence of social media over time. It would be beneficial for future research to go beyond cross sectional studies and look at findings over a longer period of time.

This topic would also benefit from additional studies which include measures of pre-existing vulnerability to body image concern and ED psychopathology in order to identify who may be most susceptible to the influences of social media.

Finally, three studies in this review commented on cultural differences in relation to social media motivation and use. These produced interesting findings and showed that cultural differences may be present. This could benefit from further investigation in order to inform culturally appropriate interventions.

## **Intervention**

Outcomes found in relation to Social Objectification theory and Social Information Processing theory suggest that a 'normative discontent' in relation to body image has been created as a social context which is continuously being reinforced by the use and features of social media. There may be a role for Clinical Psychology at a public health level to help promote different messages and use psychological theories to question thin ideals. For example theories on 'credible influences' state that when a person has overcome their biases and taken on an alternative view (such as someone recovering from an eating disorder) they

are more credible to others (Perloff, 2014). In addition drawing on ‘Social norm based’ theories, which focus on what we think important others are doing, or what we believe important others think we should be doing, and altering these opinions, can be useful (Perloff, 2014). In this way clinical psychologists may be best placed to carry out this work.

At a clinical level, when working with potentially vulnerable individuals it may be useful for clinical psychologists to ask questions to ascertain any ‘maladaptive’ social media use.

Intervention may include working through the vicious cycle suggested in the Interpersonal Formulation (Reiger et al, 2010) using a cognitive behavioural approach.

Other interventions have been suggested in the literature which include limiting screen time on social media sites, introducing media literacy programmes on the web, working with schools to educate on social media use, starting interventions at a young age (given the results found in early adolescents) and trying to reduce certain ‘maladaptive’ social media use.

Overall, having a more detailed understanding of the particular features associated with body image disturbance, and the psychological mechanisms behind them, will help inform effective intervention.

## **Conclusions**

Overall it is not possible to say that social media is causing body image concerns or eating disorder psychopathology. However, a relationship has been found between time spent on social networking sites and body image concerns, and specific features such as photo sharing and commenting appear to be responsible for much of this association. The mechanisms by which these features exert their influence would benefit from further exploration. However, some evidence was found for a number of psychological processes which may underpin these features. Whilst a relationship has been found, it remains unclear at this stage whether

individuals with pre-existing vulnerability would be most at risk from the influence of social media. Methodological weaknesses and limited literature make any conclusions tentative.

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## **Part 2: Empirical paper**

**A mixed methods exploration of the psychological effects of short-term fasting in healthy individuals**

## Abstract

**Aim:** The current study aims to expand on the existing fasting literature in relation to anorexia nervosa. It provides an in-depth account of the psychological experience of fasting in healthy individuals as a way to disentangle the effects of starvation from the overall phenomenology of anorexia nervosa.

**Method:** The study was mixed method in approach, employing a Small-N multiple single case design, alongside qualitative interviews. 14 healthy females fasted for 20 hours. During the fast EMA measures were completed at two hourly time points and participants answered semi-structured interviews about their experiences following completion of the fast.

**Results:** Results showed each individual's experience of fasting to be unique, however a number of common factors were identified. Several participants described a positive emotional experience and an increase in negative emotion on recommencement of eating, suggesting the reinforcing value of emotion. In addition, the role of intrusive thoughts, and subsequent behavioural and cognitive strategies employed to manage these, were described by many participants.

**Conclusions:** Findings suggest that a number of psychological mechanisms are employed by healthy individuals in order to cope with the experience of fasting which impact on cognitive flexibility. This indicates that some of the cognitive inflexibility and emotional experience of individuals with anorexia nervosa is related to starvation. In addition, once these strategies have been developed it might be harder for some individuals to recommence eating for reasons including increased weak central coherence, being 'stuck in set' and the reinforcing value of positive emotions. This has considerable implications in terms of unintentional food restriction and for the treatment of anorexia nervosa.

## Introduction

The current study is an exploration of the psychological effects of starvation (through the means of fasting) and aims to contribute to literature around fasting in anorexia nervosa. Anorexia nervosa holds a unique place in the mental health field due to the complexity of distinguishing between what is part of the phenomenology of the condition itself, and what might be a consequence of short-term and long-term starvation (one of the defining characteristics of anorexia nervosa). However, our limited understanding of the psychological effects of starvation makes it difficult to identify the additional features which transcend the effects of starvation, and which may be specific to anorexia nervosa. Consequently, it is important to tease apart the effects of starvation from the overall phenomenology of anorexia nervosa in order to develop effective treatments. One way to do this is to examine acute episodes of starvation experimentally through fasting studies carried out on healthy individuals.

### **Anorexia nervosa**

As noted above, one key reason to gain an increased understanding of the effects of starvation is to inform research and treatment in relation to anorexia nervosa. Anorexia nervosa is defined as (DSM-V):

- **Persistent restriction of energy intake relative to requirements**, leading to a significantly low body weight in the context of age, sex, developmental trajectory, and physical health.
- **Intense fear of gaining weight or of becoming fat**, or persistent behaviour that interferes with weight gain, even though at a significantly low weight

- **Disturbance in the way in which one's body weight or shape is experienced,** undue influence of body weight or shape on self-evaluation, or persistent lack of recognition of the seriousness of the current low body weight.

It is estimated that 0.39% of adolescent females and 1.9% of adult females have anorexia nervosa in the population at any one time (Hoek, 2006). However, these numbers may be underestimates due to the client groups' tendency to conceal the illness.

It is essential to improve treatment of anorexia nervosa, particularly as the condition is associated with the highest rates of mortality among all mental health conditions (Hoek, 2006). Some deaths result from suicide. However, the majority are due to complications linked to malnourishment (an effect of long-term starvation). It is also considered to be one of the most difficult mental health conditions to treat due to the valued nature of symptoms and an unwillingness of individuals with anorexia nervosa to engage in treatment (Hay, Touyz & Sud, 2012).

### **Neurocognitive profile**

Recently, there has been developing interest in researching a neurocognitive profile of individuals with anorexia nervosa. It is claimed that patients with anorexia nervosa appear to have a consistent cognitive profile which includes deficits in short term memory and executive function, in particular cognitive inflexibility (Stedal, Frampton, Landro & Lask, 2012; Tchanturia, Campbell, Morris & Treasure, 2005). This can be seen in set shifting deficits (impairment of the ability to move flexibly between tasks or mental 'sets') and weak central coherence (associated with over-attention to detail and difficulty seeing the 'bigger picture'). These neurocognitive features appear to manifest in anorexia nervosa through rigid

focusing of attention on food, obsessive and perfectionistic traits and focusing on calories at the expense of longer term health consequences. However, one key difficulty in the development of this type of profile is the effect of starvation (Benau, Orloff, Janke, Serpell & Timko, 2014). In a seminal study on fasting and starvation effects, Keys, Brozek, Henschel, Mickelson & Taylor (1950) showed that food deprivation has profound effects on the psychological state of 'normal' humans. Depression, anxiety, irritability, rigidity, obsessiveness and concreteness all appeared within weeks of food restriction and progressed as starvation continued. Consequently, it is very difficult to disentangle starvation effects from deficits characteristic of anorexia nervosa. A number of studies have been undertaken on individuals in recovery from anorexia nervosa in an attempt to answer this question. Some studies showed that set shifting deficits remain following recovery from anorexia nervosa (Gillberg, Billstedt, Wentz, Anckarsater, Rastam & Gillberg, 2010; Tchanturia, Morris, Surguladze & Treasure, 2002) whilst others reported that deficits improve upon recovery (Kingston, Szmukler, Andrewes, Tress & Desmond, 1996). This may be due to difficulties gathering valid post symptomatic data as a result of the chronicity of the condition and often incomplete resolution of symptoms (Vitousek & Manke, 1994). Thus the picture remains unclear.

## **Emotion**

In addition, the role of emotion has been explored fairly extensively in individuals with anorexia nervosa. Several qualitative studies on participants with anorexia nervosa have found positive emotions including 'mental strength', an inner sense of mastery and a rush of power experienced when restricting food (Nordbo, Espeset, Gulliksen & Skarderud, 2006). It was also noted that through their ability to restrict eating, some participants felt special,

different or proud of being able to do things others cannot do (Serpell, Treasure, Teasdale & Sullivan, 1999). Cognitive-behavioural models suggest that anorexia nervosa is maintained by positive reinforcement of weight loss and associated positive feelings such as a sense of control or pride (Fairburn, Shafran, & Cooper, 1998). In addition, Zink and Weinberger (2010) suggest a positive-emotion dopamine hypothesis, stating that self-starvation in anorexia nervosa may be driven by pleasure associated with restricted eating. They have provided evidence to support this in neuro-imaging studies. Again, however, it is not clear whether these emotions would be experienced in individuals without anorexia nervosa when restricting food.

### **Fasting research**

One way to begin to disentangle the effects of starvation from other aspects of anorexia nervosa is to examine acute episodes of starvation experimentally through fasting studies carried out on healthy individuals. Whilst this cannot inform us about the long-term effects of starvation, it can tell us something about the short-term effects of food restriction, which we may hypothesise to increase in severity if continued for longer.

To date most research on the effects of fasting and starvation has been on the physiological effects. However, responses to hunger and fasting vary greatly with some people finding fasting extremely difficult, whilst others find it far easier. Physiological responses to hunger may play a part in this, but psychological factors may also contribute to making fasting either a more positive or negative experience.

Johnstone (2006) states that physiological signals which affect motivation to eat and food intake are not rigidly determined, but act as cues which interact with psychological mechanisms. For example, eating can occur when a person is not hungry and it is also

possible to be hungry and not eat, thus demonstrating that psychological features can override the physiological drive to eat. Early research from Keys et al (1950) noted that psychological changes induced by lack of food were just as typical as physical changes. It was claimed that the experience of going without food produces a dominant set of 'sensations, drives and limitations to physical function' and that participants in the study produced a 'set of mind' and a 'direction of attitude' in order to endure the physical symptoms of hunger such as hunger pangs, coldness and weakness. This showed that individuals may use certain psychological mechanisms to enable them to cope with the physical experience of hunger. It seems therefore that the physiological and psychological effects of food restriction are inextricably linked and that further understanding of the psychological component is needed. Studies of fasting and cognition have shown deficits in executive functioning to develop in otherwise healthy individuals. A number of recent studies have found increased difficulty in ability to shift set and increased weak central coherence following food restriction, and therefore some of these difficulties found in individuals with anorexia nervosa could also be accounted for by short-term fasting (Pender, Gilbert & Serpell, 2014; Bolton, Burgess, Gilbert & Serpell, 2014). However, a systematic review on the effects of experimental fasting on cognition showed a more mixed picture (Benau et al, 2014). The authors found that no one cognitive function was impacted consistently and four studies addressing the role of cognitive flexibility showed differing results. The studies included in the review were however criticised on the grounds of methodological weakness and the neuropsychological tests used (which may account for any inconsistencies).

Overall, although results on fasting in healthy individuals are mixed, a number of studies show cognition to be affected by short-term fasting. For individuals with premorbid cognitive inflexibility food restriction may exacerbate it, and for those with no premorbid difficulties short term fasting may trigger these deficits. This has significant implications for the role of

unintentional weight loss and dieting in the precipitation of anorexia nervosa, particularly in light of the recent trend for the 5:2 fasting diet.

Whilst this literature indicates that food restriction leads to cognitive change in healthy individuals, the mechanisms by which this occurs require greater exploration at both the physiological and psychological level. At a psychological level Lopez et al. (2008) note that it is unclear how far set shifting deficits as a result of food restriction should be understood in terms of distraction and preoccupation with feelings of hunger or other factors. This seems consistent with Keys et al. (1950) suggestion about a 'set of mind' and a 'direction of attitude' that individuals must use in order to endure the physical symptoms of hunger. A more detailed understanding of the psychological mechanisms underpinning the ability to cope without food is therefore required.

The role of emotion in anorexia nervosa has been extensively researched. This is not surprising given the valued nature of symptoms associated with the disorder and the high levels of treatment resistance. However, in contrast, there is little research on the emotional effects of starvation through fasting in individuals who do not have anorexia nervosa.

Findings from early fasting studies in healthy individuals showed that starvation can lead to negative affective changes such as anxiety and irritability (Keys et al, 1950). However, a number of more recent studies have shown a more positive effect of fasting on emotion. One study explored the effect of fasting on emotional reactions in nurses in Iran and found that depression and stress levels were significantly reduced following Ramadan (a time where food is restricted for religious reasons), compared with before (Koushali, Hajamini, Ebadi, Bayat & Khamseh, 2013). Farooq, Nazar, Akhtar, Irfan, Subhan, Ahmed, Khan & Naem (2010) also found that during Ramadan scores for depression and mania for people with Bipolar improved. However, fasting in a religious context may introduce extra variables. A recent review of fasting in mood disorders (Fond, Macgregor, Leboyer, & Michalse, 2013)

found that fasting was frequently accompanied by mood improvement, a subjective feeling of wellbeing and sometimes euphoria. In addition, a study by Watkins and colleagues showed fasting in healthy individuals also led to positive affective experiences such as increased self-achievement, reward, pride and control (Watkins, Gilbert, Thompson & Serpell, under consideration). This finding had not been identified before in healthy individuals, and demonstrates that positive emotion associated with restricted eating may not be limited to people with anorexia nervosa or other mental health difficulties.

### **Clinical guidelines**

Increasing understanding of the psychological experience of starvation is paramount in terms of developing appropriate treatments for anorexia nervosa.

Treatment in the UK NHS is guided by recommendations from the National Institute for Health and Clinical Excellence (NICE). The current NICE guidelines for adults with anorexia nervosa (NICE, 2004) are somewhat outdated. The guidelines state that most patients are to be managed as outpatients and provided with psychological treatment and an assessment of physical risk. Therapies to be considered are CAT, CBT, IPT, psychodynamic therapies and family interventions. There is therefore very little guidance on which type of therapy to offer. Inpatients are to be offered skilled re-feeding along with psychosocial interventions (NICE, 2004). However, the NICE Guidelines are due to be updated in 2016 and it is hoped that more evidence based findings will be added, in contrast to the current focus on ‘expert opinion’.

Until the last few years CBT seems to have been accepted as a useful intervention for treating anorexia nervosa by professionals. However, a recent systematic review (Galsworthy-Francis & Allen, 2013) showed that evidence for CBT is limited. This review found that whilst CBT

demonstrates effectiveness as a means of improving treatment adherence and minimising drop out, and does show improvement in BMI, anorexia nervosa symptoms and broader psychopathology, it is not consistently superior to other treatments.

There are currently a number of studies underway to develop new treatments. This is motivated partly by methodological problems of previous trials and also by new theoretical developments such as the neurocognitive profile discussed above (Watson & Bulik, 2013). In 2007 the National Institute of Mental Health issued a request for innovative trials for anorexia nervosa which included a study on Cognitive Remediation Therapy (CRT) (Davies & Tchanturia, 2005) which is designed to improve neurocognitive abilities such as set shifting and weak central coherence.

A recent review of treatment for severe and enduring anorexia nervosa (Hay et al, 2012) found some evidence for several newer treatments based on ideas of neuro-cognition and emotion. However, these were not Randomised Controlled Trials (which are considered the gold standard of clinical trials) but a number of case series with very few participants. Further research is therefore needed before any substantive claims can be made.

Findings showed CRT led to significant improvements in set shifting, central coherence and BMI. CREST (which is CRT with additional emotional skills training) (Money, Davies & Tchanturia, 2011) also showed promising results and was proposed as a low intensity intervention to be used prior to CBT. MANTRA (Schmidt, Wade & Treasure, 2014) a newly developed treatment which addresses maintaining factors related to rigid thinking styles such as perfectionism and OCD traits, avoidance of emotion and pro anorexic beliefs also showed significant improvements in BMI, anorexia nervosa symptoms and motivation to change. This type of therapy is matched to clinical symptoms, personality traits and neurocognitive profile of patients by choosing certain modules. Finally, CBT-E (Fairburn, 2010) (which is an

extension of CBT for bulimia nervosa which includes predisposing and perpetuating factors and modules on mood intolerance, interpersonal relationships, perfectionism, low self-esteem and undereating) led to six out of 12 patients achieving full or partial recovery (Hay et al, 2012).

Many of these newer treatments have elements which focus in particular on improving cognitive flexibility as a way to increase eating/weight gain. If we are unsure whether cognitive inflexibility is pre-existing, or develops as a result of starvation, this has considerable implications for whether it makes sense to treat anorexia nervosa in this way (especially when an individual may be eating very little). If at least some of the inflexibility seen in anorexia nervosa is due to starvation then it seems re-feeding should be the cornerstone of treatment and possibly a precursor to psychological therapy.

### **Aims of current study**

The current study aims to expand on the existing fasting literature in relation to anorexia nervosa. It provides an in-depth account of the psychological experience of fasting in healthy individuals and attempts to explain why experiences of fasting may differ between individuals.

In order to obtain rich detailed data, a mixed methods study was carried out using a Small-N multiple single case design, alongside qualitative interviews.

Small-N designs can address individual uniqueness and examine change over time within an individual to gain a full understanding of their psychological experience (Barker, Pistrang & Elliott, 2002). Obtaining qualitative data in addition to this serves to make data from a Small-N design more valid (McLeod, 2001), whilst simultaneously allowing an in-depth analysis of

meta-cognitive beliefs and meaning made by the individuals in relation to their emotional and cognitive experiences. This may be key to understanding why experiences of starvation differ.

To the best of my knowledge no Small-N or mixed method studies on the psychological effects of starvation (using a fasting paradigm) have been undertaken to date.

## **Method**

### **Research design**

Participants were asked to fast for 20 hours (11pm until 7pm the following day). An Ecological Momentary Assessment (EMA) design (Stone & Shiffman, 1994) was used to collect self-report data during waking hours, with measures of mood and cognition being taken at two hourly intervals. EMA aids reduction of recall bias, allows detailed study of mechanisms of change in real-world contexts and maximises ecological validity (Shiffman, Stone & Hufford, 2008). In addition, participants were asked to record a few minutes of qualitative information at each time point to aid memory for qualitative interviews. Semi-structured interviews were carried out the morning after the fast.

### **Setting and participants**

Participants from a 'healthy' population (who have no history of eating disorders and limited experience of fasting) were recruited. A young, female sample was recruited as this is the group most at risk of developing anorexia nervosa. Participants were recruited from

University College London (UCL) through response to posters which were displayed in the psychology department, library and cafeterias (see appendix A for recruitment poster).

### **Exclusion criteria**

Participants were excluded if they had a current or past eating disorder. The Eating Disorders Examination-Questionnaire (EDE-Q) was administered at the initial screening interview to assess for underlying pathology of eating disorders to ensure the sample was truly non-clinical. Participants were also excluded if they were pregnant or had any medical condition which could make fasting a risk. Eligibility was assessed during initial screening interviews (see appendix B for screening questionnaire).

### **Sample size**

In order to obtain detailed and meaningful information recruitment of approximately twelve to fifteen participants was attempted. 15 participants attended screening interviews. However, one was deemed unsuitable on the basis of a previous eating disorder and therefore 14 participants continued to complete the full study.

### **Ethical considerations**

It was necessary to consider the ethical implications of asking participants to fast. A number of studies in which participants fasted for 20 hours had been carried out by Dr Serpell's team and no ill effects were found. In addition, active steps were taken to minimise the risks associated with fasting including provision of advice on fasting, an information sheet outlining the possible risks and informing participants to immediately stop fasting should they feel unwell (see appendix D & E for information and advice sheets). As noted above a

medical and psychological history was also taken at the initial screening interviews to screen people out with known medical conditions.

### **Ethical Approval**

Ethical approval for this study was granted by the University College London Research Ethics Committee (see appendix G).

### **Procedure**

The researcher had initial telephone or email contact with individuals who expressed interest in the study to ensure they met inclusion criteria. Individuals who met criteria were offered a screening appointment during which they read the study information sheet and written informed consent was obtained (see appendix F for consent sheet). Demographic information and initial measures were completed during screening. Participants were given information on how to complete EMA measures during the fast, and a text reminder was set up to alert them to complete the measures every two hours. In addition, advice and information on fasting safely was given to participants. Participants picked a suitable time to complete the fast and the follow up interview time was arranged for the following morning. During the interview, which was audio-recorded and lasted an average of 1 hour, open-ended semi-structured interview questions were employed flexibly and worded conversationally. All screenings and interviews were held on UCL premises. Participants were paid £20 on completion of the study to compensate them for their time (see appendix C for study protocol).

## Measures

During the initial screening interview participants were asked to complete the following measures:

### *Screening questionnaire*

This screening questionnaire was designed for the purposes of the study. It included basic questions about current physical and mental health, and history of eating disorders.

Participants were asked brief questions about their normal eating behaviour, whether they had fasted before, and how they anticipated they would find fasting.

### *The Eating Disorders Examination-Questionnaire (EDE-Q; Fairburn & Beglin, 1994).*

The EDE-Q is a 36-item measure of eating disorder psychopathology, which consists of four attitudinal scales (restraint; eating concern; weight concern; shape concern). The EDE-Q has good reliability and validity (Carter, Aime and Mills, 2001), and non-clinical norms are available (Mond, Hay, Rodgers and Owen, 2006). While it is an effective preliminary screening measure, it cannot be used alone for diagnostic purposes (Mond, Hay, Rodgers, Owen and Beumont, 2004).

The EDE-Q was used at this stage for two reasons. Firstly it was used as a screening tool to determine participants' suitability for the study. Secondly it was used to consider whether the level of eating disorder psychopathology a participant displayed had any bearing on their fasting experience.

### *Perfectionism, Persistence, and Perseveration Questionnaire (PPPQ-22; Serpell et al., 2009).*

The PPPQ-22 is a 22-item self-report measure of three constructs associated with a range of psychological disorders. "Perfectionism" is defined in the measure as having high standards for oneself. An example item is: "One of my goals is to be perfect in everything I

do”. “Persistence” is defined as the ability to keep going with a behaviour to reach a goal, even when the task is difficult or takes a long time. An example item is: “People describe me as someone who can stick at a task, even when it gets difficult”. “Perseveration” is defined as the tendency to continue a particular behaviour, even when it ceases to be effective or rewarding. An example item is: “When reading a book or magazine, I often feel that I must begin at the first page and read through to the very end, even if some of the parts are of no interest.” Factor analysis and reliability analyses support these three constructs, and they have adequate test-retest reliability in a non-clinical group (Serpell et al., 2009).

The PPPQ-22 was used to consider whether the level of perfectionism, persistence, and perseveration a participant displayed had any bearing on their fasting experience.

Throughout the fast participants were asked to complete:

*The Positive and Negative Affect Scale (PANAS; Watson et al, 1988).*

This scale consists of 20 words that describe different feelings and emotions. There are 10 positive, including words such as ‘excited’, ‘proud’ and ‘determined’ and 10 negative, including words such as ‘distressed’, ‘upset’ and ‘irritable’. Participants were asked to state “to what extent you feel this way right now, that is, at the present moment” on a scale ranging from one (“very slightly or not at all”) to five (“extremely”). Measures were completed every two hours throughout the fasting day, giving a total of six measures. Participants also provided PANAS scores at the beginning of the fasting period to give a baseline. The PANAS is deemed to have adequate psychometric properties within a large sample in the general adult population. Internal consistency was Cronbach’s  $\alpha$ .89 (positive affect scale) and  $\alpha$ .85 (negative affect scale) (Crawford & Henry, 2004).

*Attentional Function Index (AFI; Cimprich, Visovatti & Ronis, 2011)*

The AFI was designed to measure perceived effectiveness in common activities requiring attention and working memory, particularly the ability to formulate plans, carry out tasks, and function effectively in daily life. It consists of a 13-item instrument with 3 subscales - effective action, attentional lapses, and interpersonal effectiveness. Participants were asked to state “At this time, how well do you feel you are functioning in each of the areas below?” on a scale ranging from one (“not at all”) to ten (“extremely well”). Examples of questions were ‘following through on your plans’, keeping your mind on what you are doing’ and how hard you find it to concentrate on details’. Measures were completed every two hours throughout the fasting day, giving a total of six measures. Participants also provided AFI scores at the beginning of the fasting period to give a baseline. This measure was designed to be used for people with cancer and measures particular aspects of cognition. However, its use was deemed appropriate for this study due to the lack of validated measures available to assess perceived cognitive function and its brevity which allowed participants to complete it every two hours. In addition, it was also a useful prompt for participants to consider their cognitive abilities throughout the fast (which were then further expanded on during the interview). It has good construct validity and high internal validity (Cronbach’s  $\alpha=0.92$ ) (Cimprich et al., 2011).

#### *Visual Analogue Scale measures*

Participants were asked to rate urge to eat, level of hunger, difficulty fasting, sense of pride, sense of self-control, sense of achievement and preoccupation with food using VAS measures ranging from zero (“not at all”) to 10 (“extremely”). Measures were completed every two hours throughout the fasting day, giving a total of six measures. Participants also provided VAS scores at the beginning of the fasting period to give a baseline.

#### **Interviews**

The qualitative interviews focused on the following areas:

- Lived experience of fasting
- The role of positive affective experience
- The role of negative affective experience
- Perception of cognitive abilities and how they are affected by fasting
- What made fasting an easy/difficult experience
- What enabled them to continue fasting if very hungry
- Level of preoccupation with food
- Experiences at the end of the fast
- Experiences of recommencing eating again following the period of starvation

A semi-structured interview schedule (see appendix L) was developed for the study, designed in line with available guidance (Turner, 2010) and further refined following a set of pilot interviews which were carried out with four individuals who had taken part in previous fasting studies within Dr Serpell's lab. These pilot interviews helped to ascertain whether the interview questions were suitable to obtain the information required and whether the constructs on the EMA measures were understood by participants.

### **Method of analysis**

The EMA data from each participant (PANAS, AFI and VAS scores) were analysed independently by exploring individual changes at the different time points. The data is displayed in the form of a graph followed by a written description of the findings.

Interview data were transcribed verbatim. The transcription focused mainly on content rather than moment to moment interaction, however long pauses and laughter were noted.

Qualitative data was analysed using Thematic Analysis (Braun & Clarke, 2006). This method of analysis allows for each participant's data to be analysed independently, thus gaining richer information for that individual, whilst also allowing for overarching themes to be drawn between all participants to create a fuller picture. A number of stages were followed which began with reading and re-reading the data to become fully familiar with it. Initial ideas about themes also became apparent in relation to participant's individual EMA data. Once familiar with the data, initial codes were identified for interesting aspects in the data, focusing on those most relevant to the research questions that may form the basis of themes (see appendix M for initial codes and examples from transcripts and appendix N for list of codes). Following initial coding, the codes were sorted into potential themes and subthemes before reviewing them to ensure they were meaningful and coherent (see appendix O for map of initial themes). From the initial map a number of overarching themes and subthemes were defined and named, ready to be reported in the analysis.

Themes were identified and coded inductively in direct relation to the data rather than being driven by theory. Themes were not considered in relation to previous research until the discussion section of this paper. Themes were also identified semantically in line with a realist epistemology, therefore words and phrases found in the data were considered for their literal meaning and not explored for underlying assumptions or ideologies.

## **Credibility checks**

Suggestions for increasing credibility of Small-N designs include the use of standardised measures, having frequent assessment points, using systematic quantitative data and having multiple cases (Barker, Pistrang & Elliott, 2002). This study sought to fulfil all criteria. In addition, a key strength of using a mixed method approach is that incorporating the use of qualitative interviews allowed the researcher to evaluate the plausibility of any claimed changes (McLeod, 2001). However, factors such as relational artifacts, participant expectations and changes caused by other events or physiological factors other than the intervention can threaten validity for this type of design (Elliott, 2002), and were therefore also kept in mind.

Guidelines for qualitative research set out by Elliott, Fischer & Rennie (1999) were also followed in order to ensure best practice was met. These guidelines have been developed in order to help legitimise qualitative research and foster a more valid scientific review of qualitative research.

The research process was transparently presented to participants, efforts were made to contextualise the study and its participants, and quotes were used to illustrate themes to enable readers to critically judge the value and transferability of findings. A subjectivity statement was written (see below) to describe any personal biases (Preissle, 2008).

Triangulation was used to enhance trustworthiness (Carlson, 2010), whereby qualitative findings were considered along with quantitative measures obtained during the fast.

Furthermore, a colleague separately coded four transcripts, following which interpretations were compared, and a process of consensus building and elaboration of themes with the primary researcher was employed. Respondent validity was not sought due to time constraints.

## **Subjectivity statement**

I am a female trainee clinical psychologist in my early thirties. I have experience of fasting for religious reasons. I find the experience of fasting to be a very difficult one, yet also rewarding. My interest in the experiences of people with eating disorders stems from my clinical experience. Nobody in my immediate or extended family has a diagnosed eating disorder. I have attempted to 'bracket' any assumptions about the experience of fasting while conducting the research (Barker, Pistrang, & Elliott, 2002).

## Results

As this study utilised a multiple single-case design, results for EMA data are displayed in the form of graphs for each of the participants, followed by a description of the findings displayed therein. Additional information taken from interview data is provided to corroborate findings, and give a more detailed description of important findings. Finally, overarching themes found amongst all the participants are considered in the thematic analysis.

### Participant characteristics

12 participants completed EMA data at four or more time points and are included in the results. Interview data for all 14 participants is included in the thematic analysis. The mean age of participants was 21.14 years (range 18-25). Six participants were from England, three were from China, two were from Japan, one was from France, one was from the Netherlands and one was from America. The mean BMI for participants was 19.67 (range 18.1-22.1).

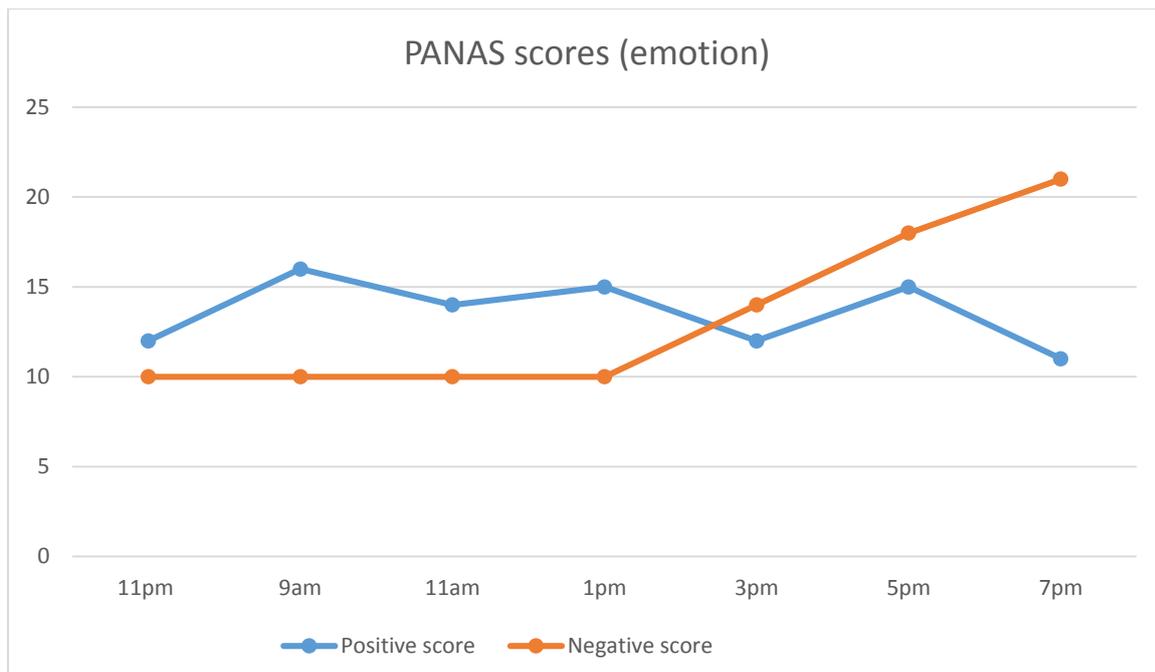
### EMA data

**Participant 1** was a 22 year old female student from China. She had not fasted before and anticipated the fast would be difficult.

BMI: 18.2

EDE-Q score: Global = 1.1375 (restraint = 0.4, eating concern = 0.8, shape concern = 1.75, weight concern = 1.6)

PPPQ-22 score: (persistence = 3.875, perseveration = 2.875, perfectionism = 3.83)



PANAS scores indicate this participant was not affected by negative emotion until the fourth time point (around lunch time, and around 14 hours after beginning the fast), after which scores for negative emotion increased at each time point until completion of the fast. The prominent emotions noted were ‘distressed’, ‘upset’ and ‘guilty’. Positive emotion scores remained relatively stable (only ranging between 12 and 16 out of a possible 10 to 50) throughout the fast. However, levels of ‘determination’ were observed to reduce most of all positive emotions as the fast continued.

Interview data reveals further detail about this participant’s emotional experience. She reported feeling very determined at the start of the fast.

*“Maybe I thought today I have an unusual experience and so I feel more determined, yeah, I think, I will finish it...”*

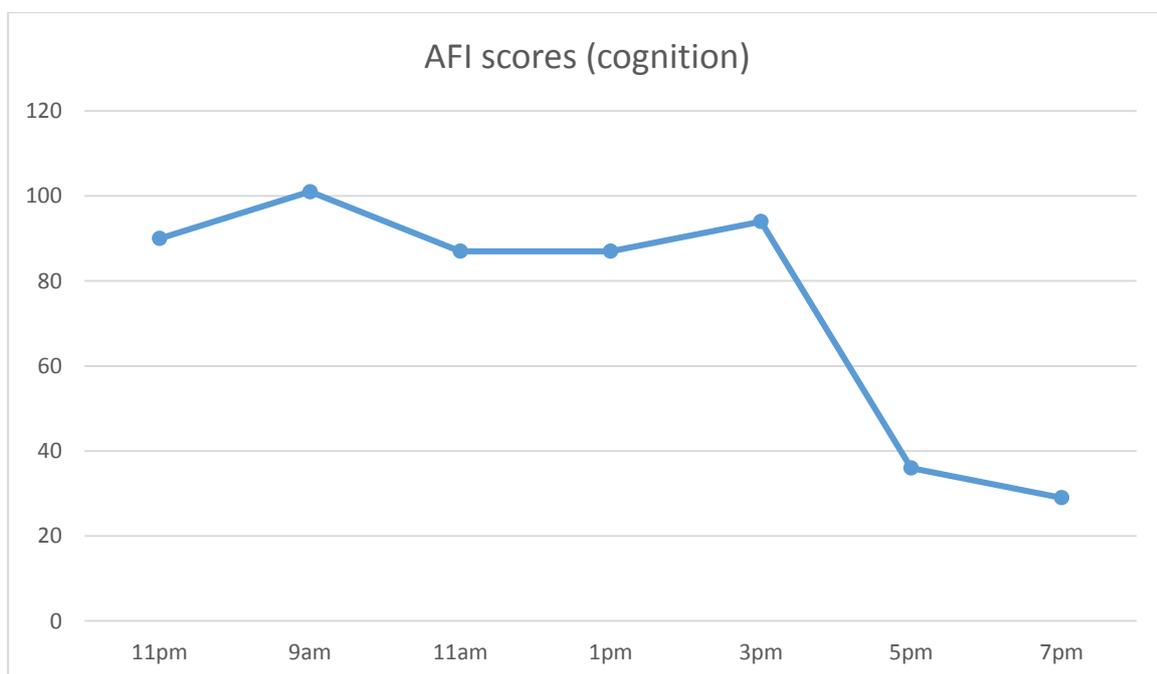
She also described ‘determination’ as being part of her personality and therefore it is interesting to consider what compromised this for her.

*“Yeah because, just my personality I will always make plans before the day and I will follow strictly all of the plans.”*

This participant described beginning to experience more negative emotions later in the fast, in particular ‘guilt’. On further exploration she reported going shopping with friends to distract herself from feelings of hunger. Although this seemed to be a helpful strategy for her, it seems this also led to feelings of guilt for not sticking to her plan of completing university work.

*“I feel really guilty because I just leave that kind of material to Wednesday [day after the fast]”*

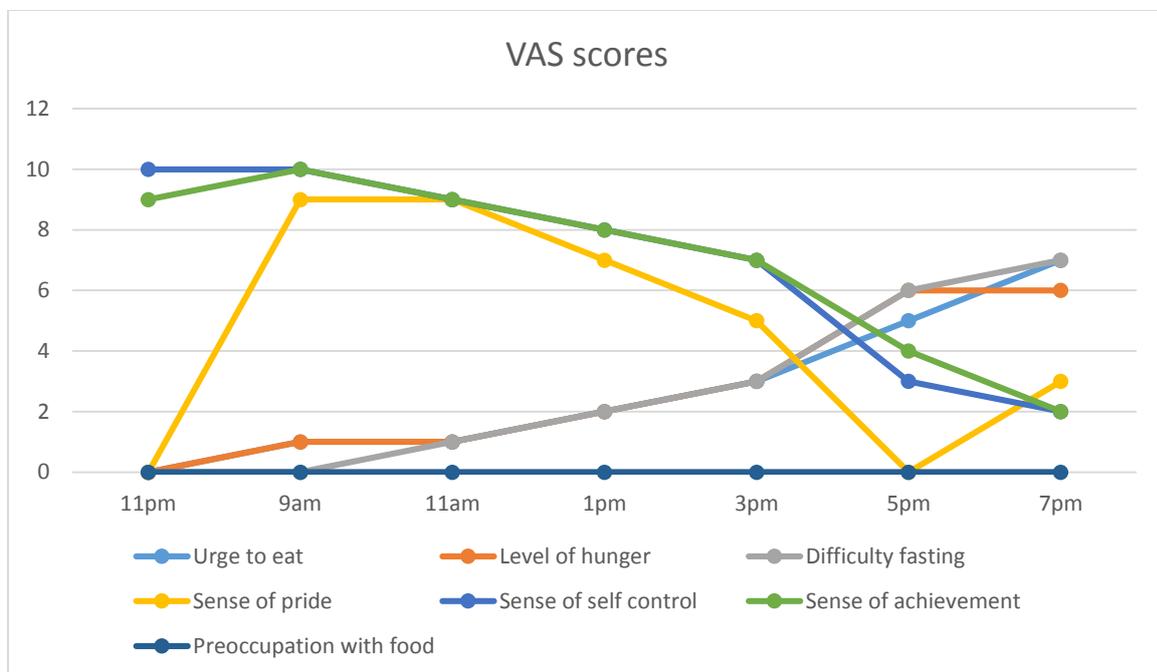
These feelings of guilt and annoyance at herself were apparent in negative emotion scores from the start of the afternoon until the end of the fast. The participant reported feeling a sense of relief at the end of the fast, however it seems any sense of achievement was masked by guilt for having not completed her work as she had set out to do.



AFI scores indicate this participant’s cognitive function became poorer throughout the fast, particularly in the final hours. She reported finding it very difficult to concentrate on university work as the day went on and harder to tune out of intrusive thoughts about food.

*“I have to study in a really quiet experience and that is why, I try to read something I can't stop thinking about something to eat first so that's what make it difficult.”*

As a result she reported that productivity was far lower than on a non-fasting day. She attributed this to finding it difficult to persevere with tasks and giving up more easily than she would do normally. Given that she had described ‘determination’ and ‘perseverance’ as part of her personality (and this was evident in her PPPQ score) this may indicate that her ability to persevere with more than one task at once was compromised and her focus had to be used for not eating.



This participant’s level of hunger, urge to eat and level of difficulty fasting increased at similar rates, implying that as the physiological signs of hunger increased, the fast was experienced as more difficult. Sense of self control, pride and achievement all reduced throughout the fast for this participant. It seems, therefore, that she initially felt good about herself for doing the fast, but as time went on these feelings reduced. This is perhaps due to the feelings of guilt and distress that came as a result of not being able to stick to her plans and complete the tasks she had set out to compete. Interestingly, no difficulties were with

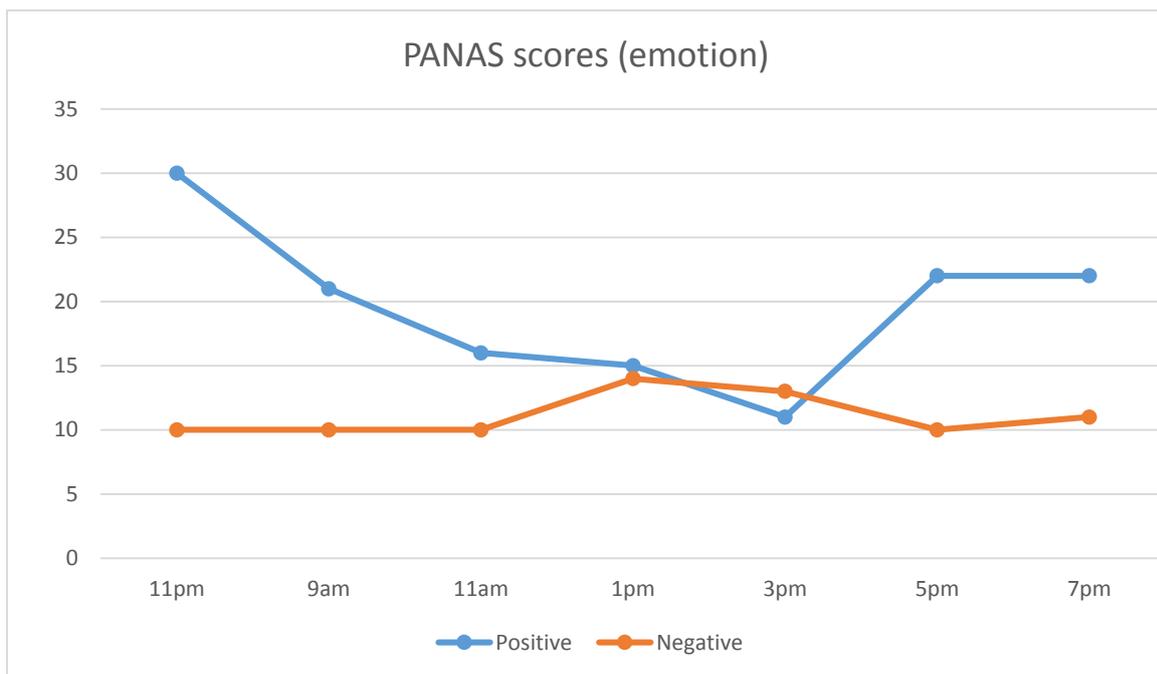
reported with preoccupation with food. This is contrary to descriptions in the interview data which suggests she may have misunderstood the term.

**Participant 2** was a 19 year old female student from Japan. She had fasted once before for religious reasons and anticipated she would feel grumpy, weak and drained throughout the fast.

BMI: 18.7

EDE-Q score: Global = 0.4125 (restraint = 0, eating concern = 0, shape concern = 1.25, weight concern = 0.4)

PPPQ-22 score: (persistence = 3, perseverance = 2.5, perfectionism = 3.16)



PANAS scores indicate that positive emotion reduced throughout the day for this participant until the fifth time point, and then increased until completion of the fast. The emotions noted to effect scores most significantly were 'interested' and 'strong' which reduced throughout the day, and 'excited', 'enthusiastic' and 'proud' all of which reduced until 3pm and then increased substantially towards the end of the fast. Negative emotion remained low for the

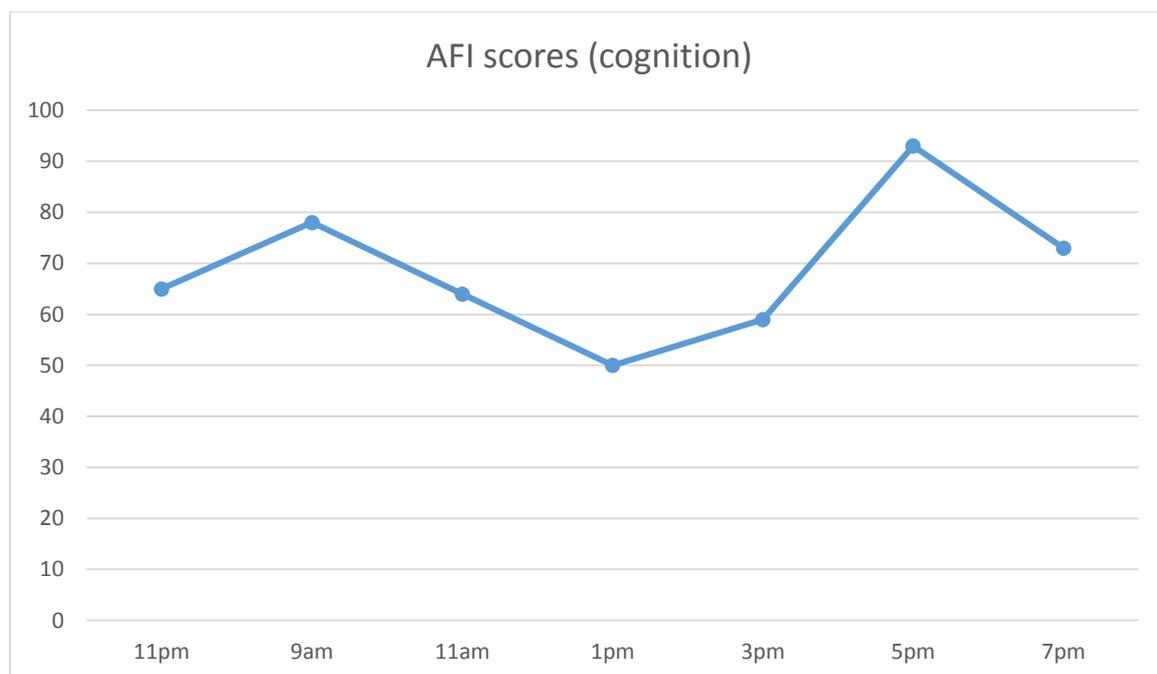
majority of the fast, with just a slight rise between time points three and five. The emotions which contributed to the raised score were 'jittery' and 'irritable'.

During the interview this participant described her negative mood state as 'frustration' at not being able to eat and perhaps frustration at herself for not feeling that she could last longer.

*“Just feeling a little frustrated that I was, that I wasn't able to eat. Because I thought I'd last longer, around till dinner time maybe”.*

She attributed the increase in positive emotion to a mixture of pride at having completed the fast and excitement at being able to eat again.

*“Hmmm I didn't want to give up because I don't like giving up usually. I wanted to see it till the end and see how long I did. And then by the end I was proud of myself for not eating”.*



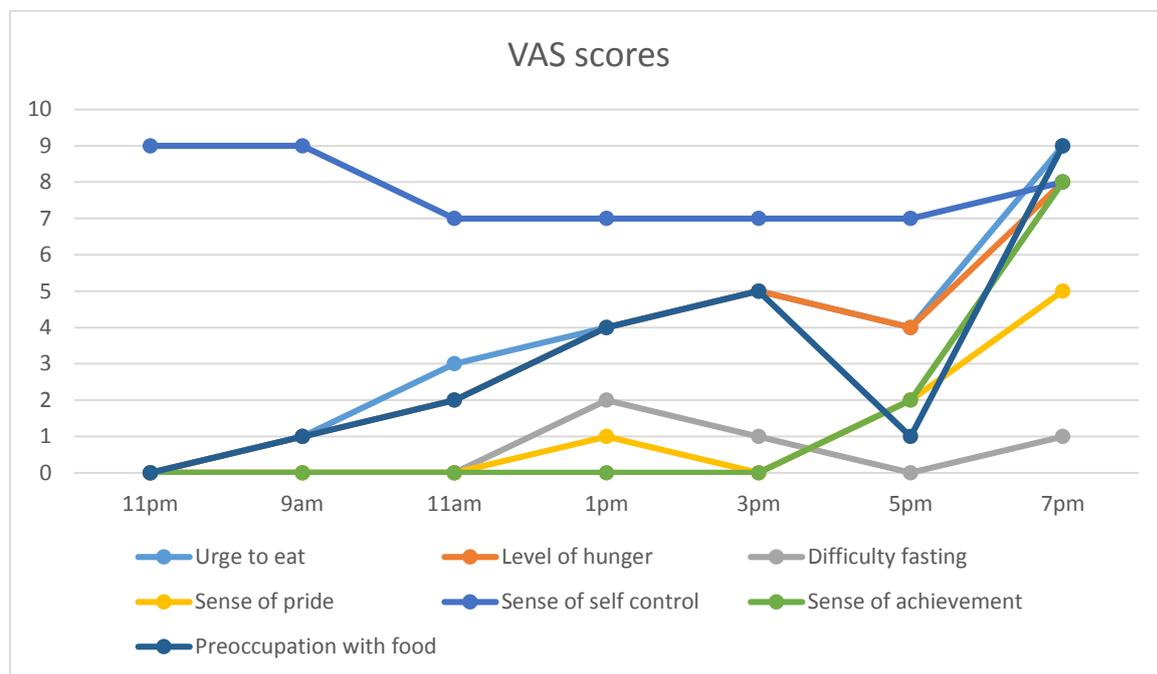
AFI scores indicate that cognitive function decreased throughout the morning, steadily increased throughout the afternoon and then dipped again in the final hours of the fast.

Interview data revealed that this participant's level of hunger reduced after lunch, which it seems may have had an effect on her cognitive function. She reported frequent intrusive

thoughts of food as it got nearer to lunchtime which were impacting on her ability to concentrate. However, as the intrusions reduced, it seems her cognitive abilities increased.

*“The lecture before lunchtime all I could think of was food. I mean I was listening to the lecture, I'd be looking at whatever's on the board and then just the food keeps coming in. And I was literally cooking in my head...”*

At the most difficult time she reported her ability to concentrate, focus on things, take in new information and not become distracted to be most affected.



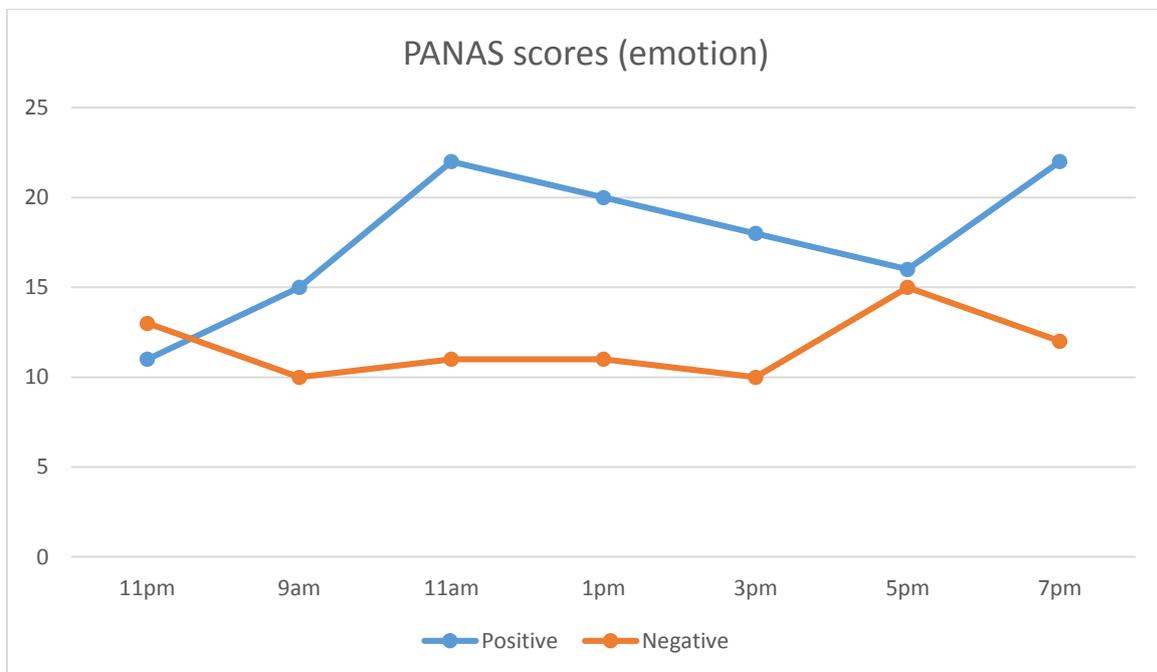
This participant’s level of hunger, urge to eat and level of preoccupation with food appeared to follow the same pattern of steadily increasing throughout the day, reducing in the afternoon and then peaking at the final time point. This may highlight a relationship between intrusive thoughts about food and physiological sensations of hunger. Sense of self-control remained high throughout the fast. Sense of pride and achievement were relatively low until time point five and then increased for the remainder of the fast, along with self-control. This fits with the increase in positive mood seen towards the end of the fast and may highlight the role of pride and achievement as the individual realises they are going to successfully complete the fast.

**Participant 3** was a 23 year old female student from England. She had not fasted before and anticipated the fast to be relatively easy until the middle of the day and then to become very difficult for the final few hours.

BMI: 19.8

EDE-Q score: Global = 0.2125 (restraint = 0, eating concern = 0.2, shape concern = 0.25, weight concern = 0.4)

PPPQ-22 score: (persistence = 3, perseveration = 1.5, perfectionism = 2.33)



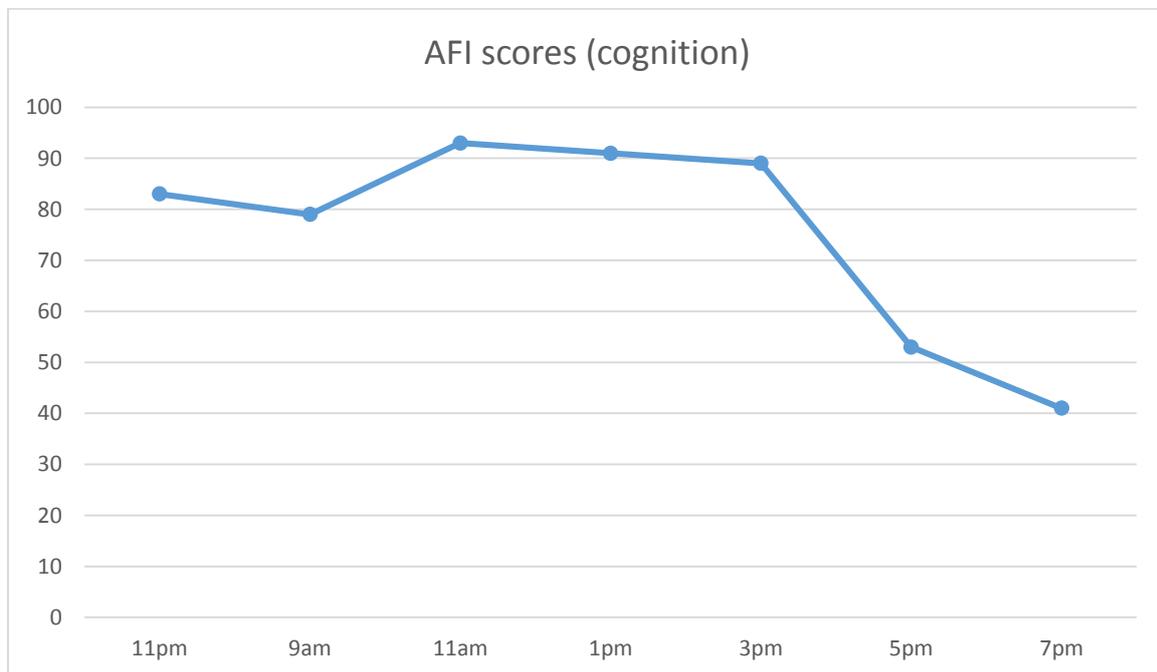
PANAS scores indicate positive emotion increased during the morning until the third time point, decreased gradually throughout the afternoon and then rose sharply during the last two hours of the fast. The key positive emotions were 'interested' and 'strong' which reduced throughout the afternoon, and 'excited' and 'active' which increased significantly at the end of the fast. Negative emotion scores were low for most of the day, with just a slight rise around the penultimate time point. The emotion which contributed to the raised score was 'jittery', which could be a physical manifestation of 'excited' or 'active'.

Interview data corroborates these findings. The participant described her emotional state as fairly ‘neutral’ or normal throughout the day. However, she noted experiencing a significant change in mood for around the last three hours of the fast where she described feeling ‘hyper’.

*“I guess maybe I think I remember when I was walking...maybe that was when I started to feel kind of a little bit hyper, when I was walking. And also felt almost a sense of urgency. I felt like I was walking quite fast. And just everything from that point on was quite quick. Like I was saying before I had to keep a lid on things. Perhaps almost slowing myself down because I felt quite hyper.”*

She reported this feeling lasted until the fast was completed and that she felt ‘calmer’ once she had eaten.

*“I still felt hyper until I kind of got home....and then and then that's when I ate and it was all kind of calm”.*



AFI scores show that cognitive function increased slightly in the morning, remained stable until the fifth time point, then decreased significantly until completion of the fast. Of note is that her emotional experience altered considerably at this point as well (i.e. becoming ‘hyper’, ‘excited’, ‘jittery’) which suggests a link between emotion and cognitive function.

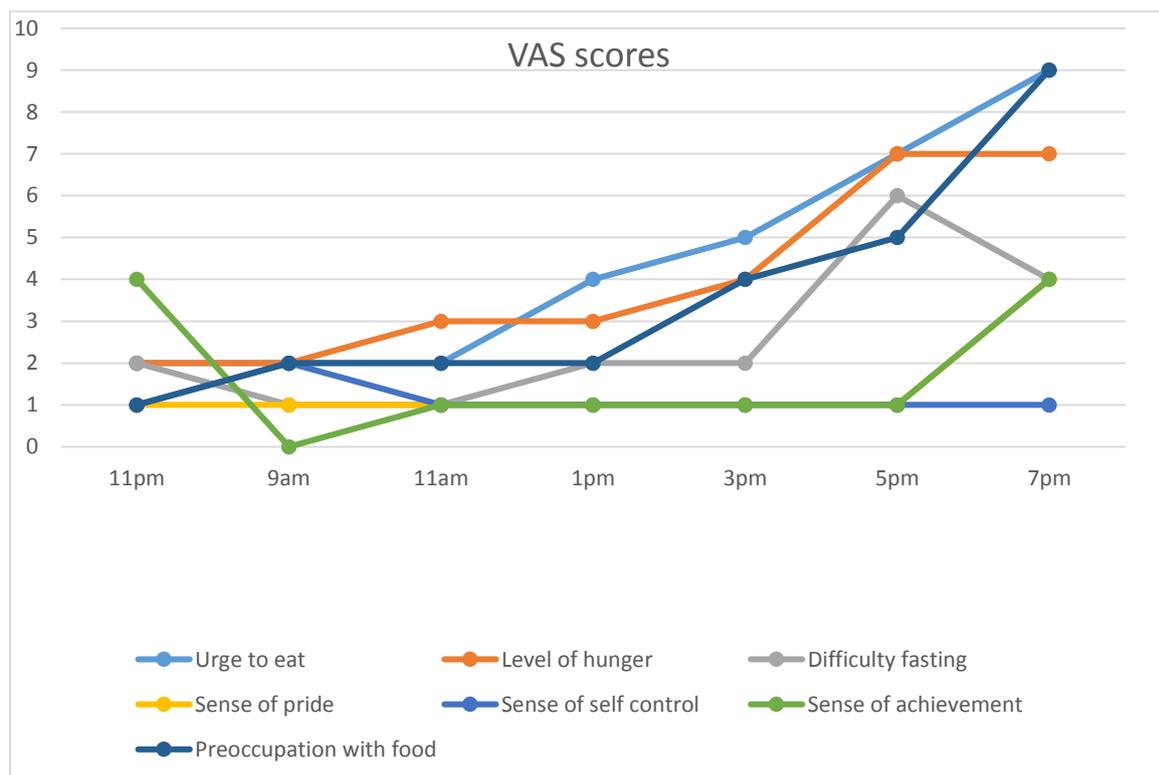
During the interview this participant reported that her cognitive function was better than normal in the morning. She said that in order not to think about food, she focused very hard on whatever else she was doing and therefore felt in some ways her concentration was better.

*“Yeah, I didn’t think about it [food] because I was really focussed on what I was doing”.*

However, she reported that in the final few hours her memory and attention were affected.

*“But yeah, I noticed that I couldn’t recall things very well so I was slipping my words and when I was writing I was making silly mistakes”.*

She also described finding it harder to take in new information, solve problems and not become distracted towards the end.



This participant’s level of hunger, urge to eat and level of preoccupation with food appeared to be linked. The pattern they followed of increasing throughout the fast fits with interview and AFI data of cognitive experience, and may suggest that as the initial technique of focusing elsewhere stopped being effective, intrusions of food returned and impacted on both her physiological experience and cognitive function. Level of difficulty fasting was relatively

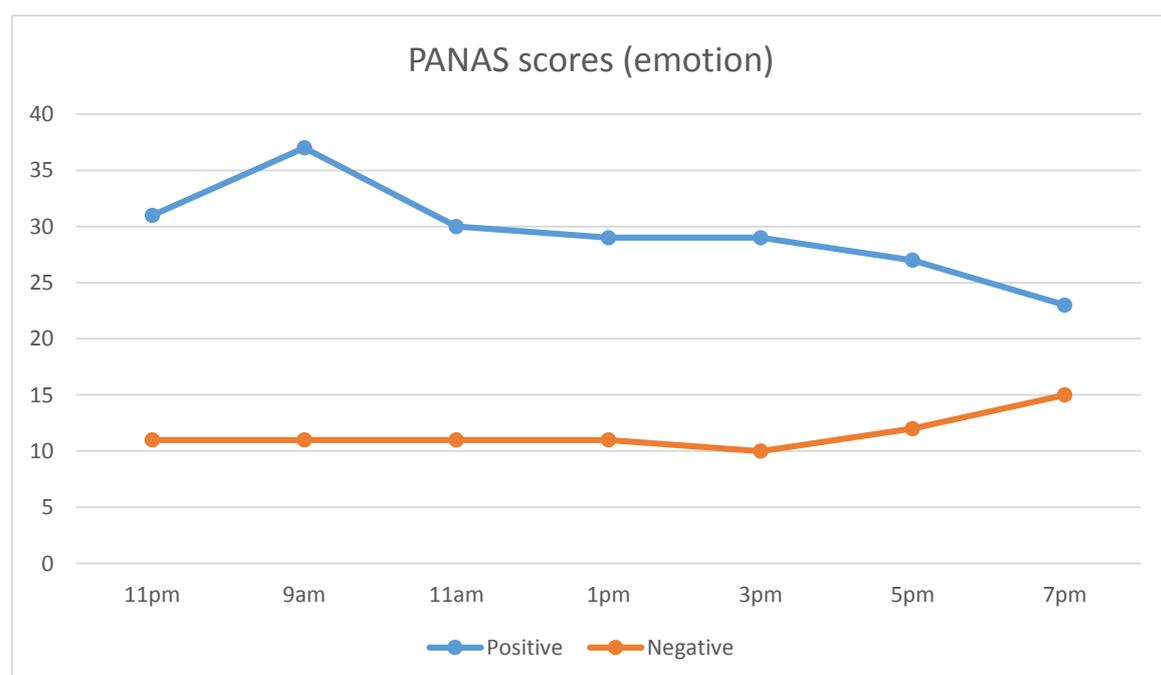
low until the fifth time point, increased sharply until the penultimate time point and then reduced towards the end of the fast. Again, this is in line with the emotional and cognitive experiences described and may show that an increase in positive emotion reduces the level of difficulty in fasting. Sense of pride and achievement were both low until the penultimate time point and increased a little in the final stages of the fast in line with overall positive emotional experience.

**Participant 4** was a 20 year old female student from England. She reported having skipped meals before, but had not fasted for a full day. She anticipated becoming ‘ratty’ towards the end of the day and finding it difficult to concentrate.

BMI: 20.7

EDE-Q score: Global = 0.71875 (restraint = 0.6, eating concern = 0.6, shape concern = 0.875, weight concern = 0.8)

PPPQ-22 score: (persistence = 4.125, perseveration = 2.125, perfectionism = 3.66)



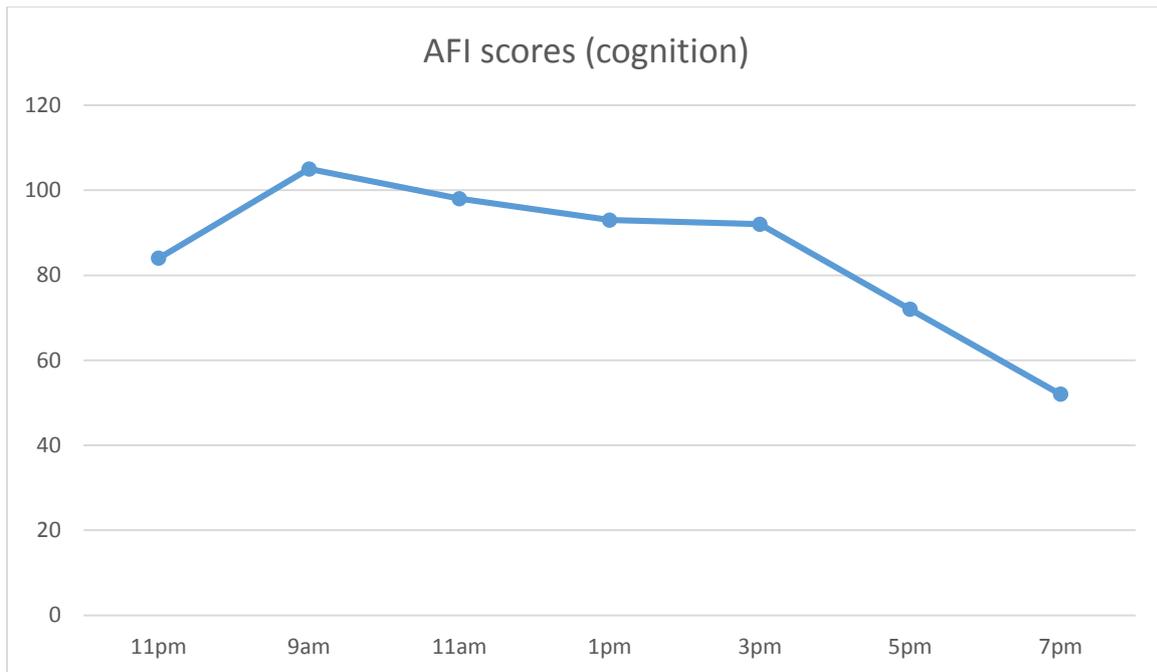
PANAS scores indicate very little negative emotion present throughout the fast, with just a slight increase towards the end. The negative emotions associated with the increase were ‘irritable’ and ‘jittery’. Positive emotion was highest in the morning and reduced slightly over the course of the fast. However, from the start to the end of the fast there was only a reduction of 10 points, indicating little change. The positive emotions noted to decrease were ‘interested’, ‘excited’, ‘enthusiastic’ and ‘determined’. Overall, however, the experience of fasting did not seem to have a significant emotional effect on this participant.

During the interview this participant described how she had remained determined for most of the fast, but that this determination reduced at the end.

*“Until like probably...5pm. Or like I had the resolve I suppose not to eat so in a sense determination, but at 5pm I was just fed up of it by then, I wanted to eat”.*

In addition, it seemed that once the determination had gone irritability increased, which the participant attributed to the negative experience being self-induced.

*“The frustration that I knew...know that you're doing it to yourself and you know you're not concentrating because you haven't eaten. That was the most frustrating or the hardest thing”.*

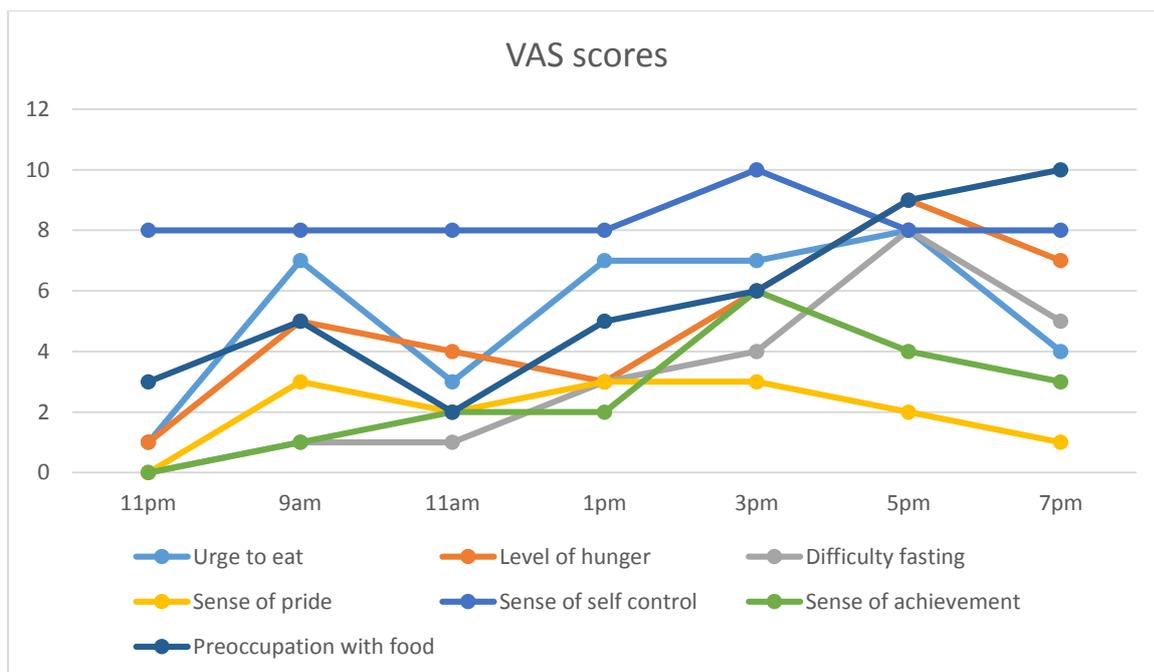


AFI scores were highest at the start of the day and gradually reduced throughout the fast. This participant described her mind as ‘not as sharp’ and said that her mind kept wandering. She also reported slower information processing, finding it harder to take in information and concentrate. Overall she found she was far less productive than on a normal day. She linked some of these difficulties to the frequent intrusive thoughts about food she was experiencing and described becoming ‘fixated’ on what she was doing in order to ‘block out’ the thoughts about food.

*“And also if I did try and concentrate really hard on my work I'd have to be completely absorbed in that. So you'd have to become fixated on what you were doing. So that you weren't thinking about food or...anything else”.*

This participant also noticed that she became more focused on detail that she is normally.

*“If I had to read an article and try and skim read it I would have found that very hard. In that you'd probably start honing in on stuff because you were trying to understand it so much and that was taking a lot longer to do one line and that you would almost, almost forget what had gone before”*



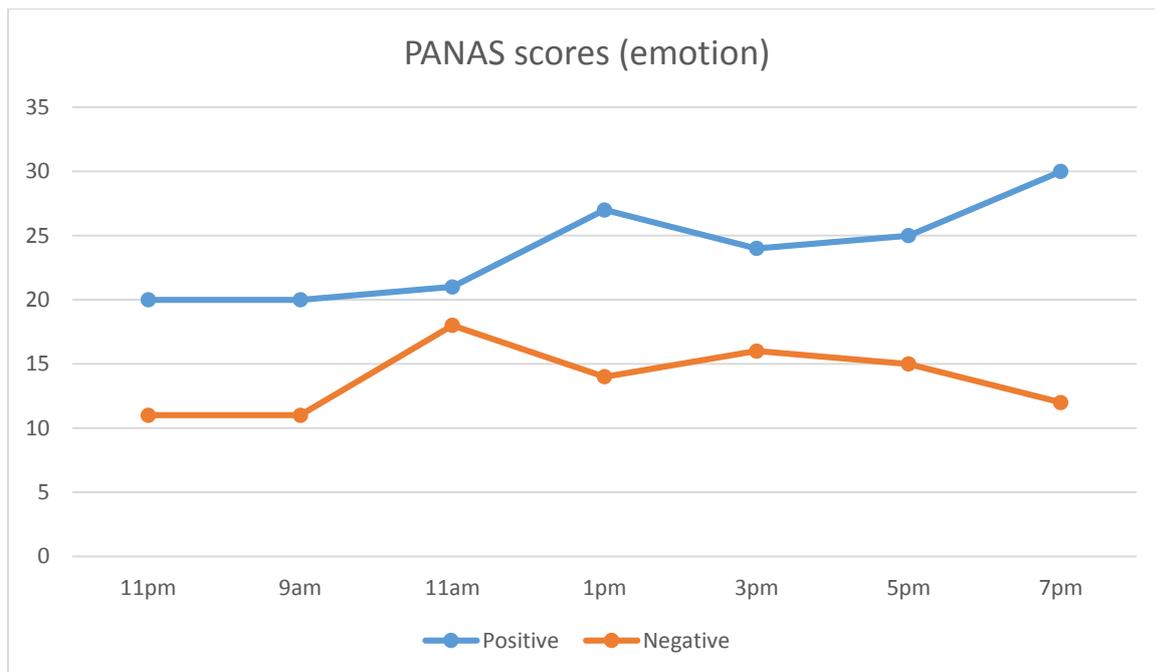
This participant's level of hunger, urge to eat and difficulty fasting increased at similar rates, (peaking at the penultimate time point then reducing until the end) suggesting that physical feelings of hunger, along with preoccupation with food, made the experience most difficult for this participant. Preoccupation with food was at its lowest in the morning (when scores for cognitive function were highest) and then increased significantly at each following time point. Sense of self-control remained high throughout the fast, yet sense of pride and achievement remained relatively low for this participant, which may be a reason for why her mood was relatively low at the end of the fast.

**Participant 5** was a 23 year old female student from England. She had not fasted before and anticipated experiencing many cravings throughout the fast that would be difficult to manage.

BMI: 22.1

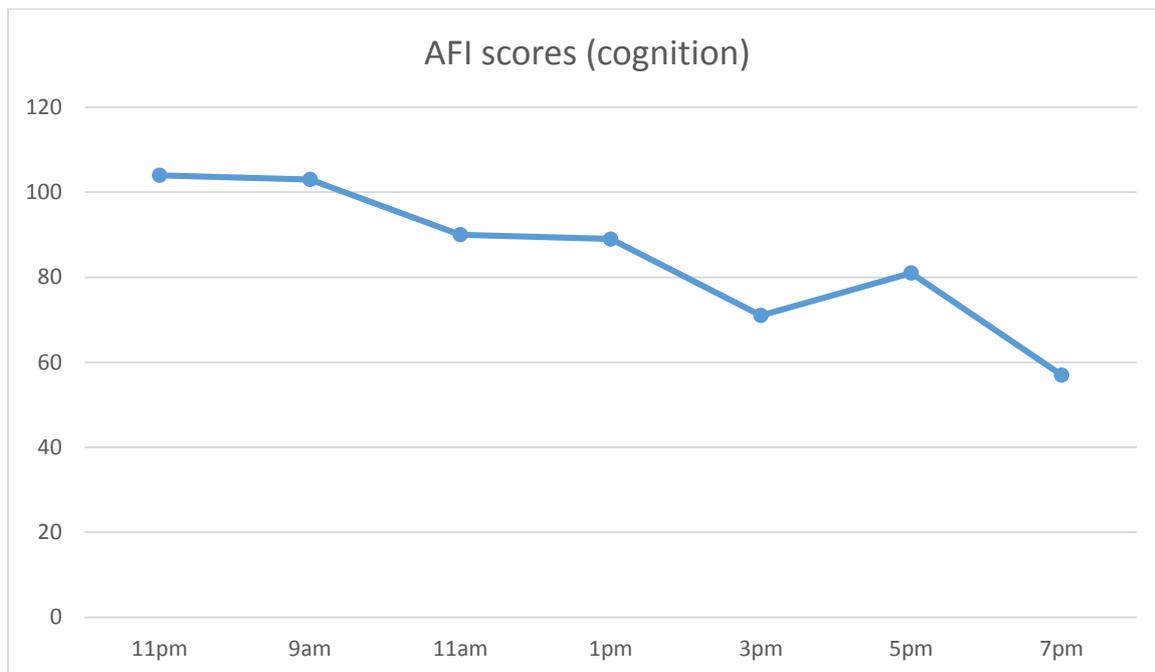
EDE-Q score: Global = 1.375 (restraint = 2, eating concern = 0.6, shape concern = 1.5, weight concern = 1.4)

PPPQ-22 score: (persistence = 3.125, perseveration = 2.75, perfectionism = 2.5)



PANAS scores showed an increase in positive emotion and little change in negative emotion from the start to the end of the fast (with the exception of a peak in negative mood at the third time point). The emotions related to increased positive scores were ‘determined’, ‘proud’ and ‘strong’ which were all at their highest at the end of the fast. The increase in negative emotion is accounted for by ‘distress’ and ‘irritability’. However interview data revealed that this participant had made a phone call to her GP at 11am which she had found very frustrating which may account for any change in emotion at this point. She described all her emotions as heightened throughout the fast, whether positive or negative.

*“yeah, I was definitely more aware of everything and because of that I just think that my emotions were slightly heightened. So, when I was laughing it was more of a hysterical laugh (laughs) and when I was...someone said...oooh I've got a cold....instead of just being like oh what a drama queen I particularly thinking Oh my god, what a pain, don't be so annoying”.*



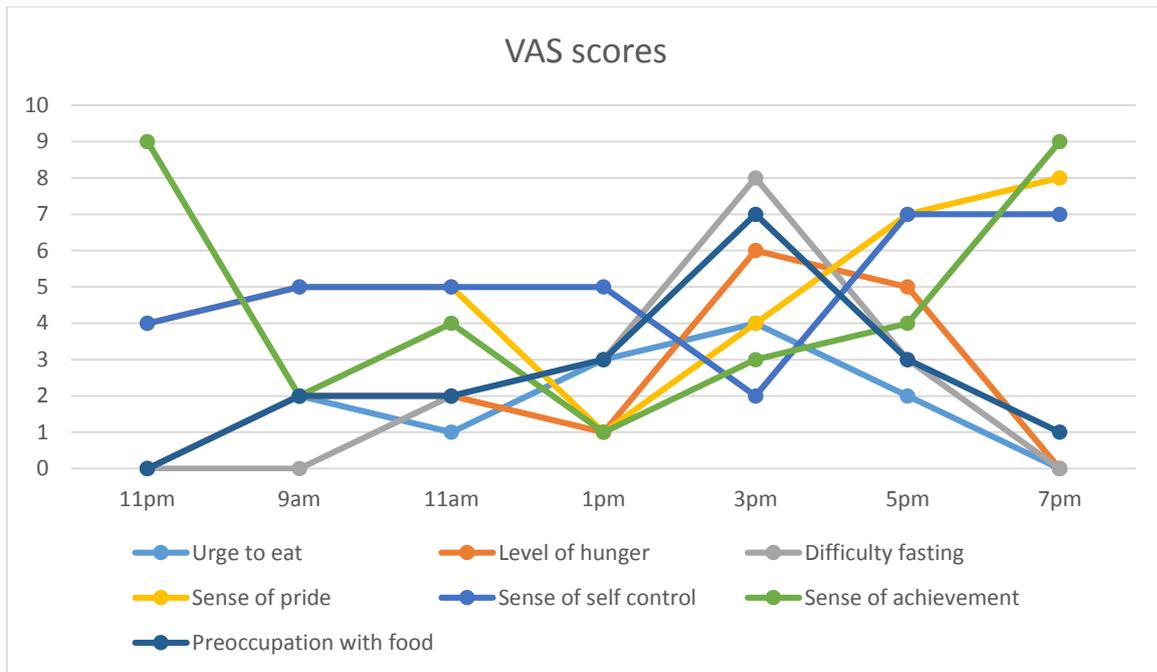
AFI scores indicate that cognitive function became gradually poorer. This participant reported her ability to be ‘attentive’ and her productivity was better than normal at the start of the day, but that towards the end of the day it became a lot worse.

*“I just did much more than I thought I would do, so that was the time when I was more attentive. On the other hand at the end of the day it was the opposite. I couldn't have retained information if my life depended on it”.*

She described finding it very difficult to concentrate at the end of the day and that she could not keep a train of thought due to frequent intrusive thoughts and images about food.

This participant also noticed that she became more focused on detail that she is normally.

*“ Well for example when I'm reading an article I normally skim read it first then read it properly and....sometimes I take notice of a few things and I'm like 'oh this is odd, note to self in the seminar ask...or in the seminar ask someone'. Instead I took notes, I was like 'Oh this, this is interesting...' instead of saying 'oh I'll cover it in the seminar' I actually wrote this could be this, this could be that...there's this theory... this is this guy, what's his name and actually focussing to remember the name in order to speak whatever... In that sense I was very productive”.*



This participant's level of hunger and level of difficulty fasting followed the same pattern (peaking at time point 5 and then reducing for the remainder of the fast), which may imply that as she noticed the physical sensations of hunger the fast was experienced as more difficult, and as the hunger dropped so did the difficulty. Preoccupation with food also followed this pattern as did her urge to eat, although at a lower rate. Interestingly, this participant's sense of self control followed the opposite pattern, i.e. when her hunger peaked sense of self-control was at its lowest, and then increased again towards the end of the fast when she was not finding it as difficult. This implies that perceived self-control may also be linked with the level of difficulty experienced. Sense of pride and sense of achievement were at their lowest in the morning and then increased steadily until the end of the fast.

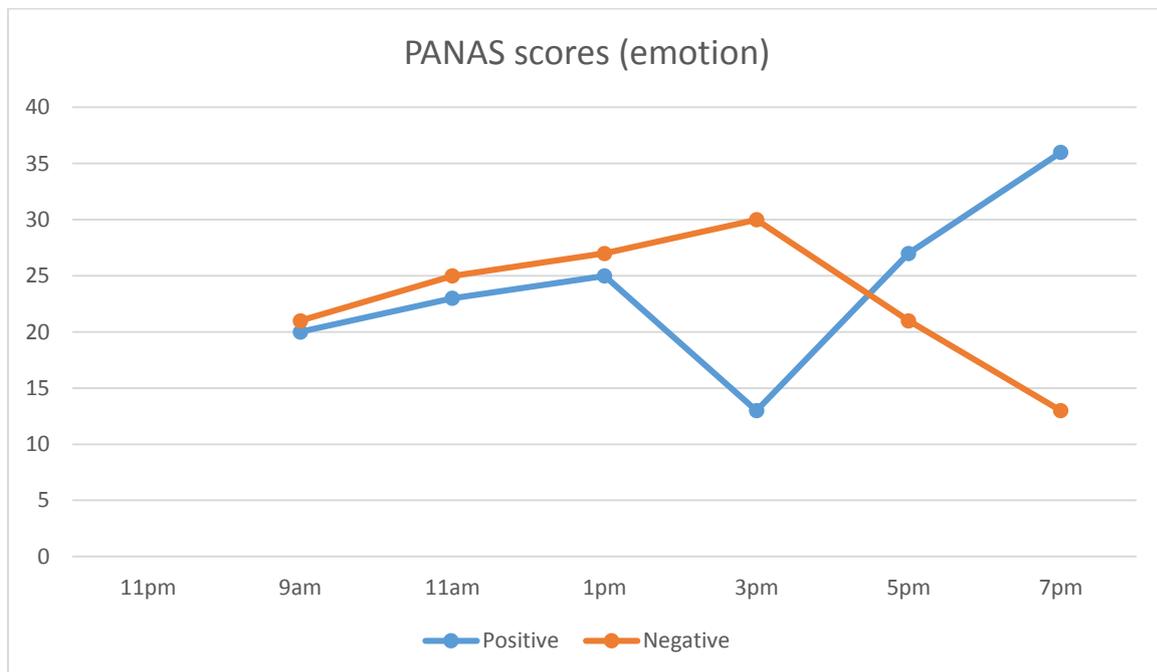
**Participant 6** was a 23 year old female student from America. She had done detox diets before but not had fasted. She anticipated the fast to be very difficult and expected to experience mood swings and energy crashes.

BMI: 21.3

EDE-Q score: Global = 1.76875 (restraint = 1.4, eating concern = 0.6, shape concern = 2.875, weight concern = 2.2)

PPPQ-22 score: (persistence = 3.5, perseveration = 2.75, perfectionism = 4)

This participant did not complete measures at the first time point and therefore scores are only available from time point 2 onwards.



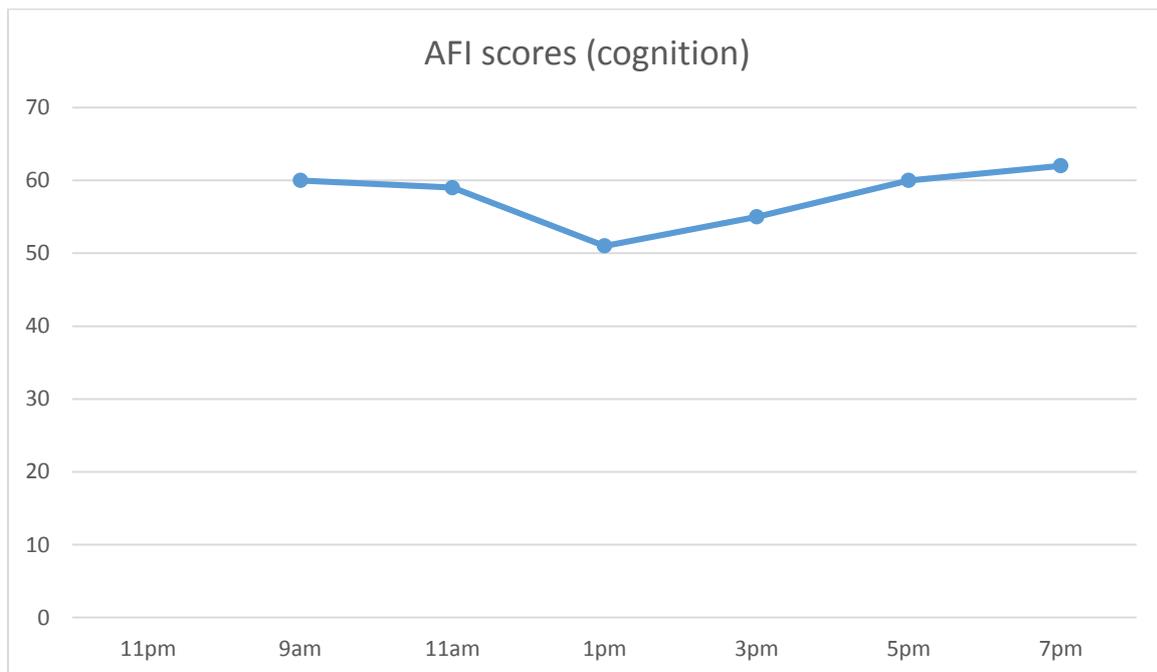
PANAS scores indicate that negative emotion increased until time point 5 and then significantly decreased until the end of the fast. The emotions responsible for this change were ‘distress’ and ‘upset’, which reduced notably. In relation to this, scores for positive emotions increased significantly from the fifth time point. The emotions noted to increase were ‘interested’, ‘strong’, ‘enthusiastic’, ‘proud’, ‘inspired’ and ‘determined’.

During the interview this participant described this change in mood.

*“There was like a big switch in the day that I think is a huge notable thing where I was furious the moment I woke up and I realised it could be eating because the first thought that came into my head was what should I have for breakfast... and then there was just like a*

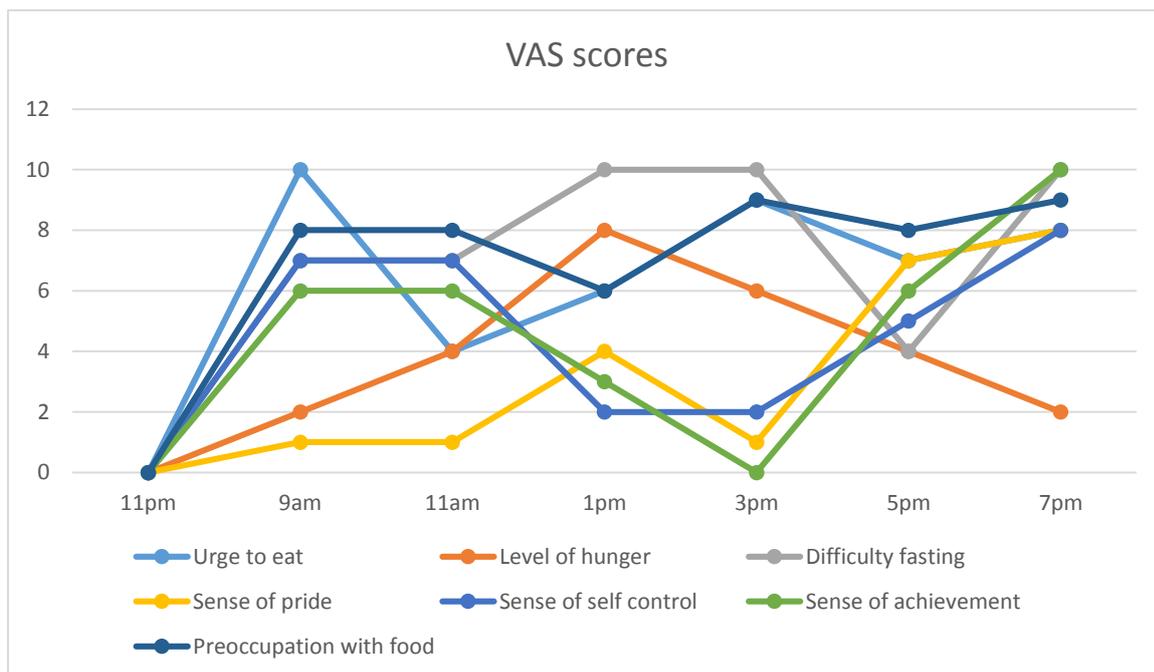
*breaking point later in the day where I felt like I just did that and I'm awesome and I wasn't as hungry and there was like an optimistic feeling”.*

It seems at this point that level of hunger and urge to eat had reduced, but that more importantly a sense of achievement had emerged which appeared to carry this participant through the remainder of the fast.



AFI scores indicate this participant’s cognitive function did not alter significantly throughout the fast. In the morning scores reduced by approximately 10 points and following this they increased steadily until the end of the fast and ended at approximately the same score as at the start. This is contrary to findings from most of the other participants. It may be interesting to consider whether such a change in emotion at this time led to increased cognitive function (or a perceived increase).

During the interview this participant described her emotional experience in more detail than any cognitive changes. However, she did report memory and concentration being affected during the middle of the day and that she found it difficult to stay focused due to frequent intrusive thoughts about food. She also described increased focus on other tasks to take her mind off food.



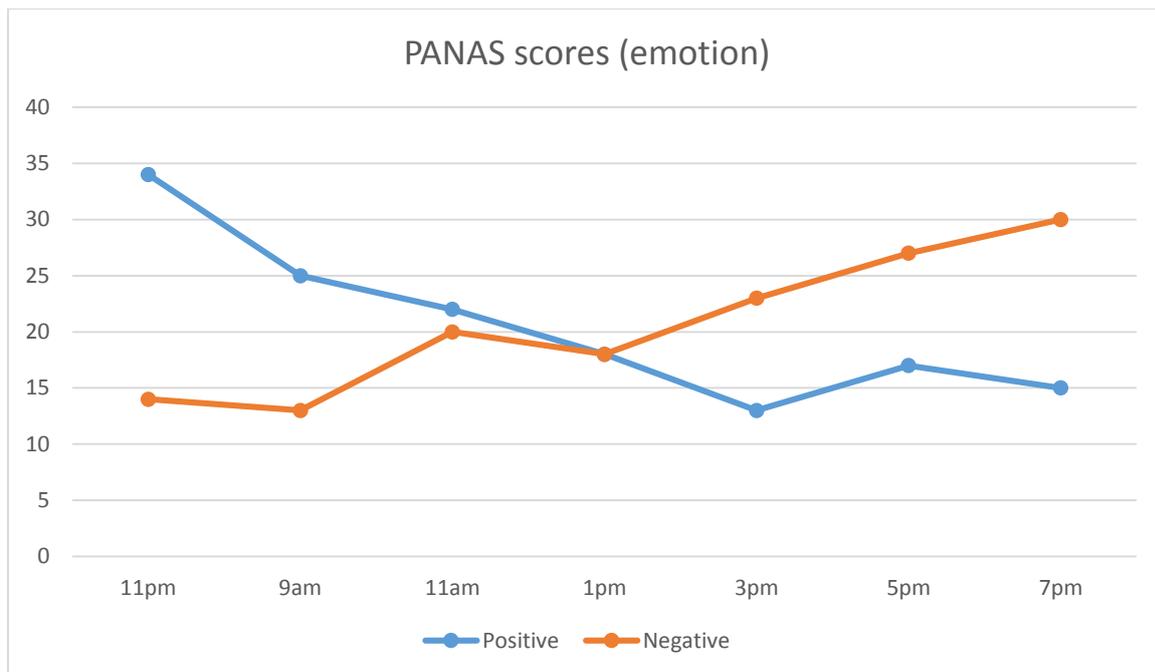
This participant's level of hunger, urge to eat and difficulty fasting were all highest in the afternoon (fifth time point), the time she described as being the most difficult. Following this, level of hunger, urge to eat, difficulty fasting and preoccupation with food all decreased, and sense of control, pride and achievement all increased which confirm her description of a 'shift' at this time. This fits with the increase in positive mood seen towards the end of the fast and may indicate sense of pride and achievement being key in lifting her mood.

**Participant 7** was an 18 year old female student from England. She had not fasted before and anticipated the fast would be difficult.

BMI: 19.5

EDE-Q score: Global = 0.1125 (restraint = 0.2, eating concern = 0, shape concern = 0.25, weight concern = 0)

PPPQ-22 score: (persistence = 2.75, perseveration = 2.375, perfectionism = 1.33)



PANAS scores indicate that positive emotion started high and reduced throughout the fast, whereas negative emotion started low and increased throughout the fast. The two emotional states intersected around time point four. The positive emotions noted to be most prominent were ‘interested’, ‘excited’ and ‘enthusiastic’, all of which reduced as the fast went on. ‘Pride’ began high, dipped in the middle of the fast and increased again towards the end of the fast and ‘determination’ remained the high throughout the fast. To account for the increase in negative scores, ‘distress’, ‘hostility’ and ‘irritability’ all increased throughout the fast.

Interview data revealed that the participant’s distress was due to ‘not getting things done’ which then led to anxiety. This emotional state appeared to outweigh any of the positive emotions she had experienced.

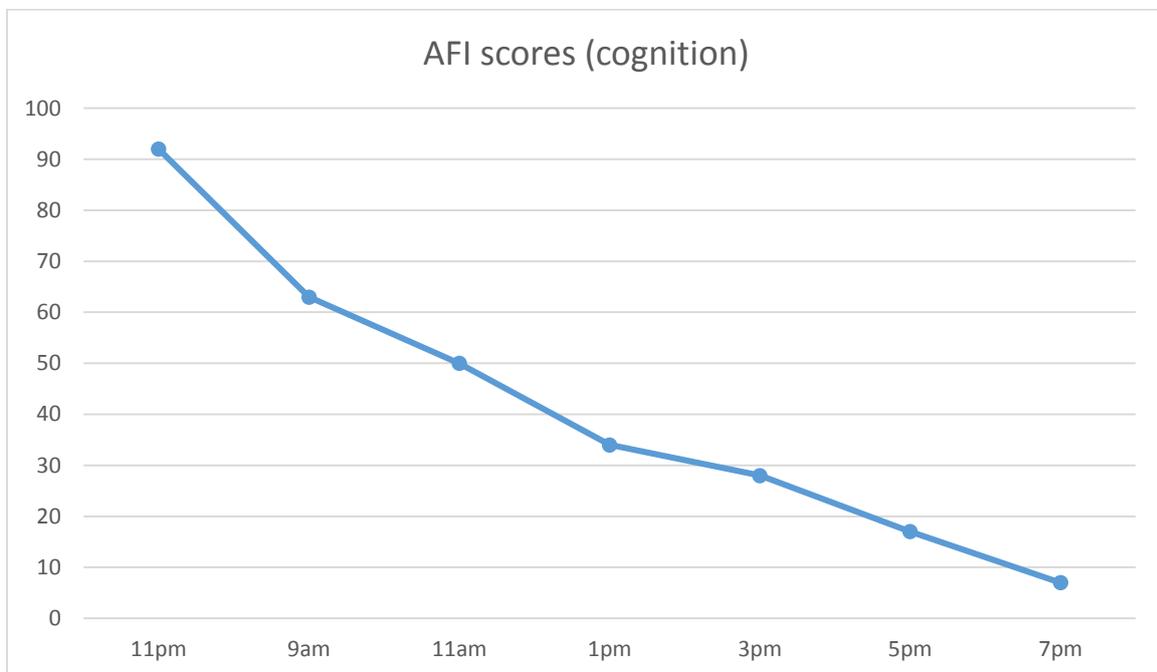
*“Feeling quite stressed actually just like really like anxious, I felt I had lots to do, lots of things in my mind and I just like kind of not doing any of it... I mean I have a bit to do but I didn’t like, it wasn’t an awful amount to do. So I was just feeling quite like unnecessarily really stressed and anxious...”*

It is interesting to note that ‘determination’ remained high throughout the fast, yet this participant was not able to ‘get things done’. This may indicate a difficulty in remaining

determined about more than one area and that in order to complete the fast any determination had to be used for this.

This participant also described using structure and planning to help ease this anxiety, something which she said was unusual for her.

*“Yeah, I mean I probably got more, I don’t know if it’s the right word, but more high maintenance about things than I expected. Because I’m not very, like usually I’m not very like that, I like having kind of having no structure, no plans, but I was quite, yeah, I got more anxious about things and more needed a structure and plans”.*

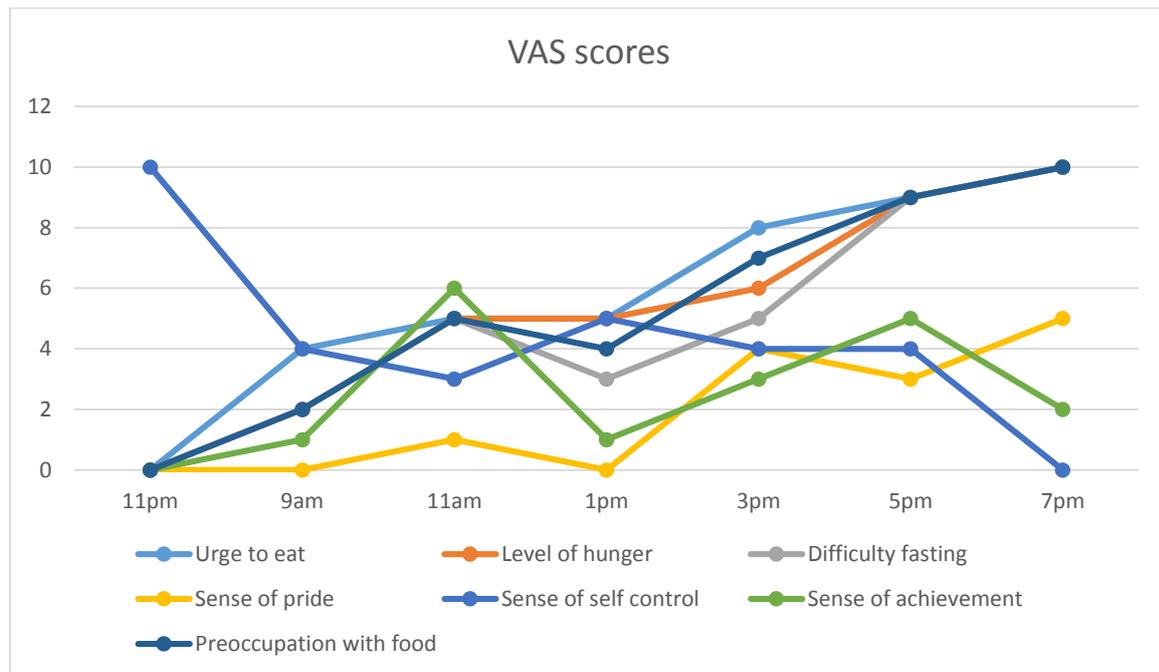


AFI scores indicate that cognition function decreased at each time point. This participant reported finding it harder to take in and process information and difficulties with memory, concentration and focus. These difficulties seemed to increase in line with frequent intrusive thoughts about food towards the end of the day.

She reported giving up more quickly on things than she might do normally as it was hard for her mind to stick to one train of thought. She also described focusing harder on other tasks so

as not to think about food, but this too became increasingly difficult as the fast went on and appeared to lead to the anxiety noted above.

*“Well I'd try and keep focussed. When I was doing work I'd try and keep focussed on it. I mean like, my attention span was really small. Like trying to work and I'd switch off quickly. But I would try and keep trying to focussed that I didn't think about food for like and I wouldn't be hungry as much”.*



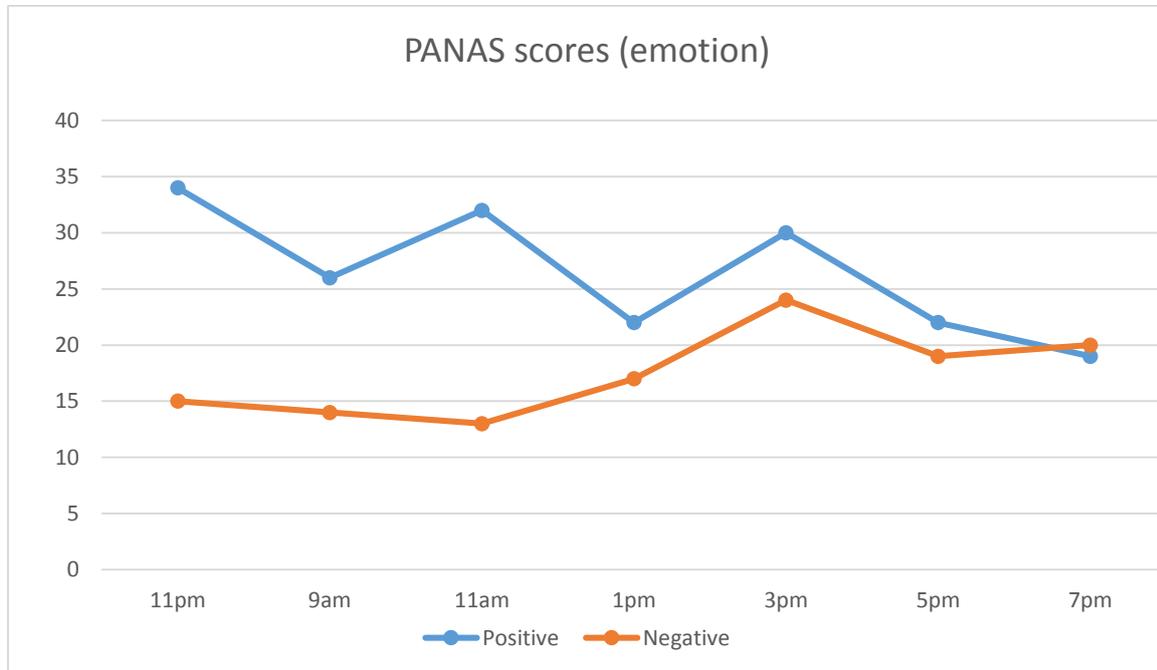
This participant’s level of hunger, preoccupation with food, urge to eat and level of difficulty fasting all increased at similar rates throughout the fast indicating a link between these factors. Sense of self control was steady throughout the day and was at its lowest at the end of the fast. Sense of pride increased from around the fifth time point. However, sense of achievement reduced at the end of the fast which may be in response to not having achieved the other tasks for the day.

**Participant 8** was a 19 year old female student from Japan. She had not fasted before and anticipated the fast to be easy, but that she would feel very hungry.

BMI: 18.7

EDE-Q score: Global = 1.86875 (restraint = 1.6, eating concern = 2.6, shape concern = 1.875, weight concern = 1.4)

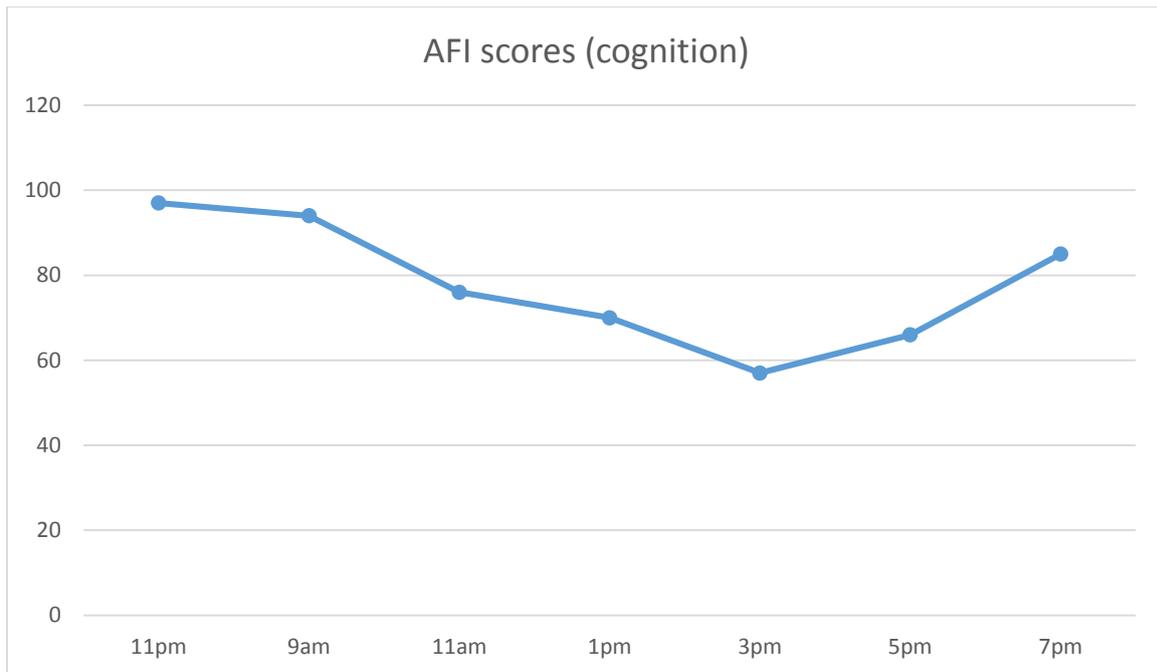
PPPQ-22 score: (persistence = 2.625, perseverance = 2.25, perfectionism = 4)



PANAS scores indicate positive emotion began reasonably high and gradually reduced throughout the fast with some fluctuation between time points. The positive emotions noted to be most prominent were ‘interested’, ‘inspired’ ‘determined’ and ‘enthusiastic’, all of which reduced as the fast went on. Negative emotion was low at the start of the fast, increased during the mid-stages and decreased slightly towards completion of the fast. The most notable negative emotions were ‘distress’, ‘upset’ and being ‘nervous’ which all increased throughout the fast.

Interview data highlighted this participant’s emotional experience of fasting as moving from positive to negative to more positive again.

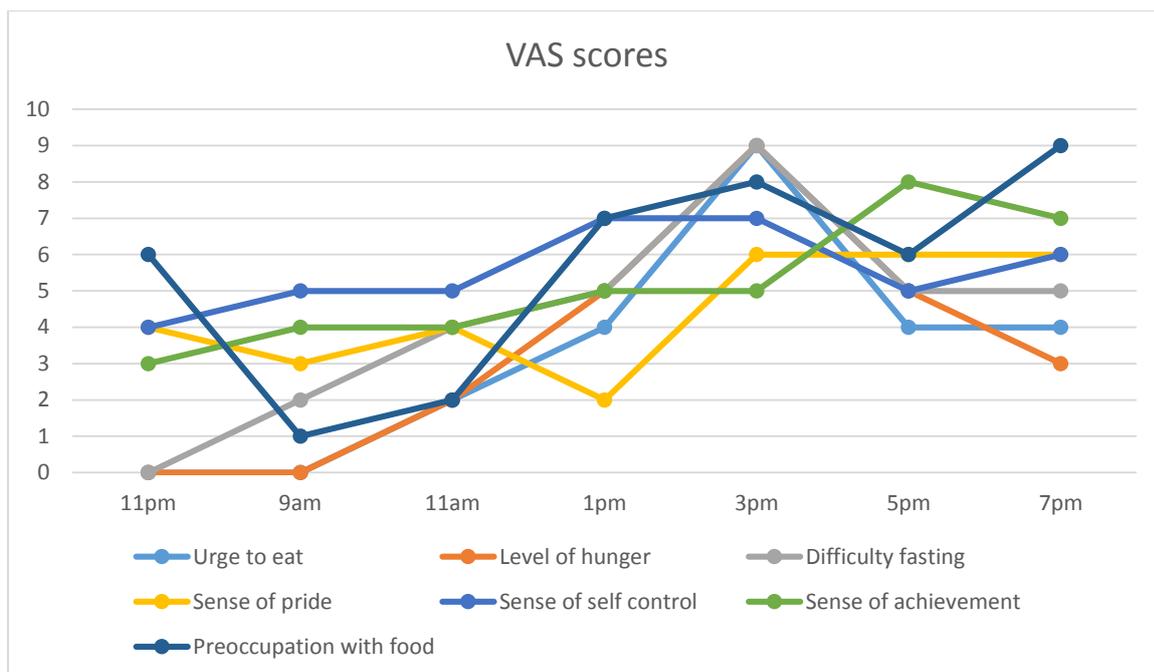
*“In the morning I feel ok, and then you feel hungry, and then everything becomes better and you don’t feel hungry at all and maybe you accustomed to it”.*



AFI scores showed that cognitive function appeared to follow a similar pattern to this participant's description of her emotional experience. At the start of the fast scores were high, they dropped during the middle of the day and increased for the remainder of the fast. She reported that at the point when she was most hungry (around 3pm) she found it most difficult to concentrate as she experienced many intrusive thoughts about food. This participant described being very focussed most of the time, but as soon as she reduced her focus on something the thoughts about food would be there.

*“Every time when I finished something, like when I have lecture I was thinking about the text, even sometime my tutor stopped talking I started to get hungry I would think about food. And also when I wrote the report and finish my homework the thoughts came back again”.*

It seems that when this participant's mind was not focused elsewhere the intrusions of food were more frequent.



This participants level of hunger, level of difficulty fasting and urge to eat followed the same pattern throughout the fast (increasing gradually, peaking at time point five and then reducing for the remainder of the fast). This is in line with the positive-negative-positive experience described during interview. Preoccupation with food was high at the start of the fast, low in the morning and then increased continuously throughout the fast. Sense of self control peaked at the time reported to be the most difficult. Sense of pride and achievement were at their lowest in the morning and then increased steadily until completion of the fast. However, the scores remained relatively low.

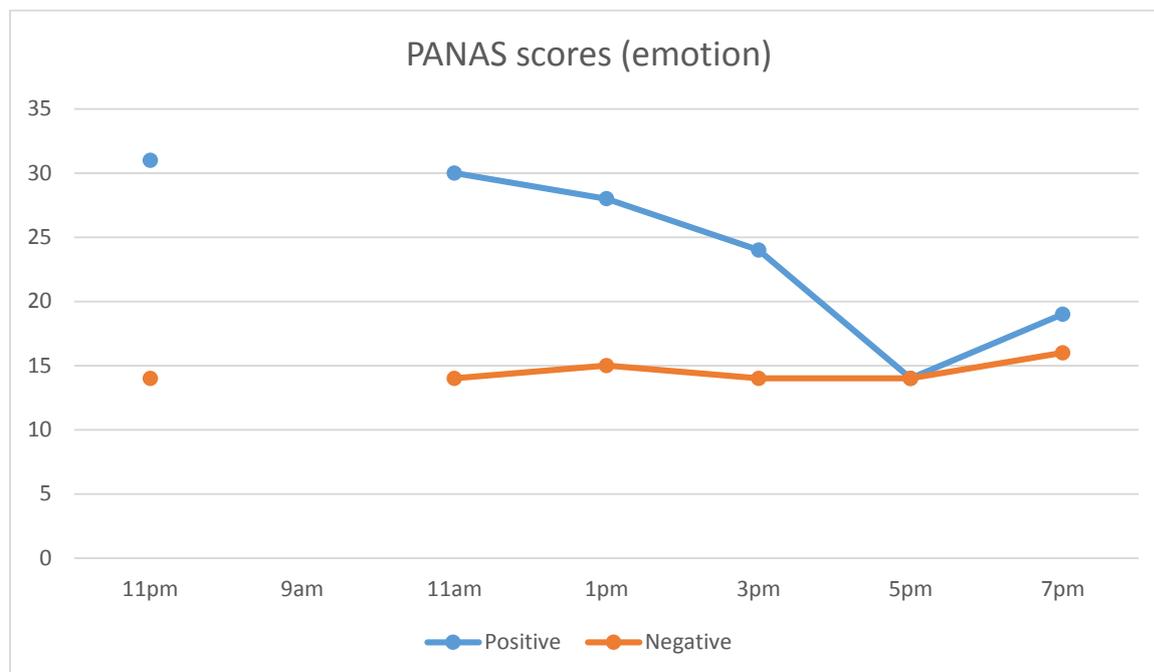
**Participant 9** was a 19 year old female student from England. She had not fasted before and anticipated the fast would be fairly difficult.

BMI: 18.5

EDE-Q score: Global = 0.4124 (restraint = 1.4, eating concern = 0, shape concern = 0.25, weight concern = 0)

PPPQ-22 score: (persistence = 2.875, perseveration = 2, perfectionism = 2.33)

This participant did not complete measures at the second time point. These scores have therefore been omitted from graphs.



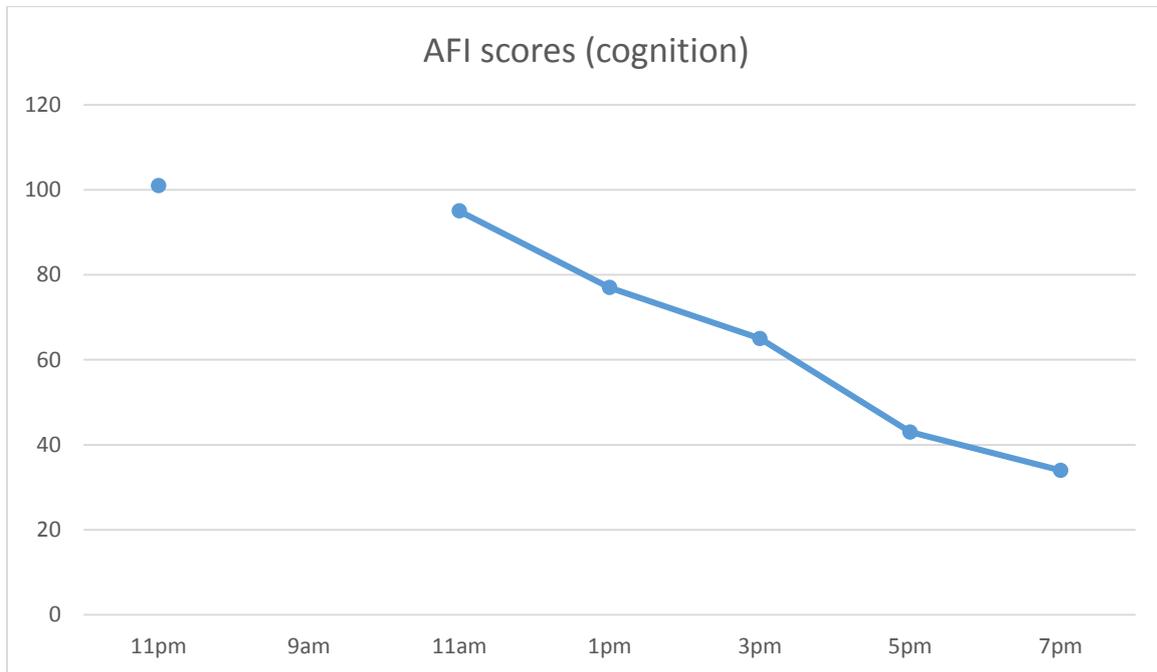
PANAS scores indicate positive emotion began reasonably high, reduced throughout the fast and then increased slightly towards the end. The positive emotions noted to reduce were ‘strong’, ‘inspired’ and ‘enthusiastic’. An increase in ‘pride’ accounts for the increase at the final time point. Negative emotions remained low throughout the fast, increasing marginally at the end which can be accounted for by ‘upset’ and ‘hostility’ increasing by 1 point.

During the interview this participant described how her level of hunger contribute to her mood.

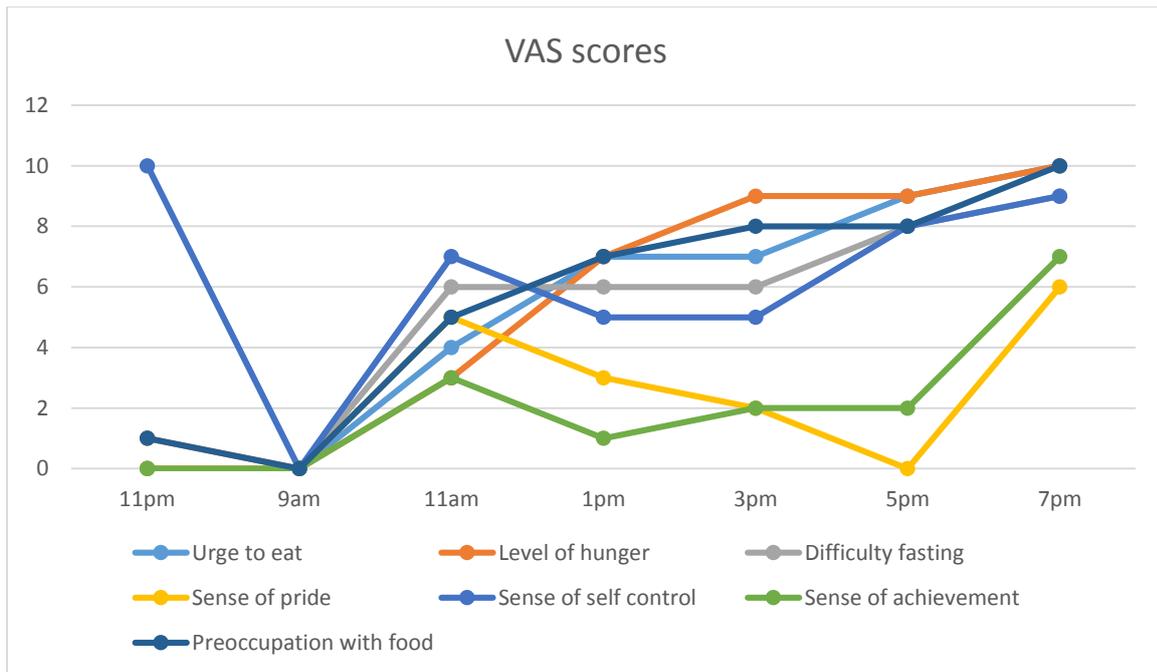
*“I was getting like a bit more annoyed when I was hungry”.*

She also described feeling low in mood during the middle of the day, and her mood lifting again towards the end of the fast which she attributed to a sense of achievement for being able to complete the fast.

*“I was in the middle of the day like I can't do it. But I carried on so I suppose again I was like happy that I'd done it”.*



AFI scores indicate cognitive function was high at the start of the fast and decreased at each time point throughout the fast. This participant reported finding it increasingly difficult to concentrate and that at the point when she was most hungry (around 3pm) she was experiencing frequent intrusive thoughts about food. She described her productivity as far less than on a normal day and attributed this to feeling lacking in energy and that she ‘couldn’t be bothered’.



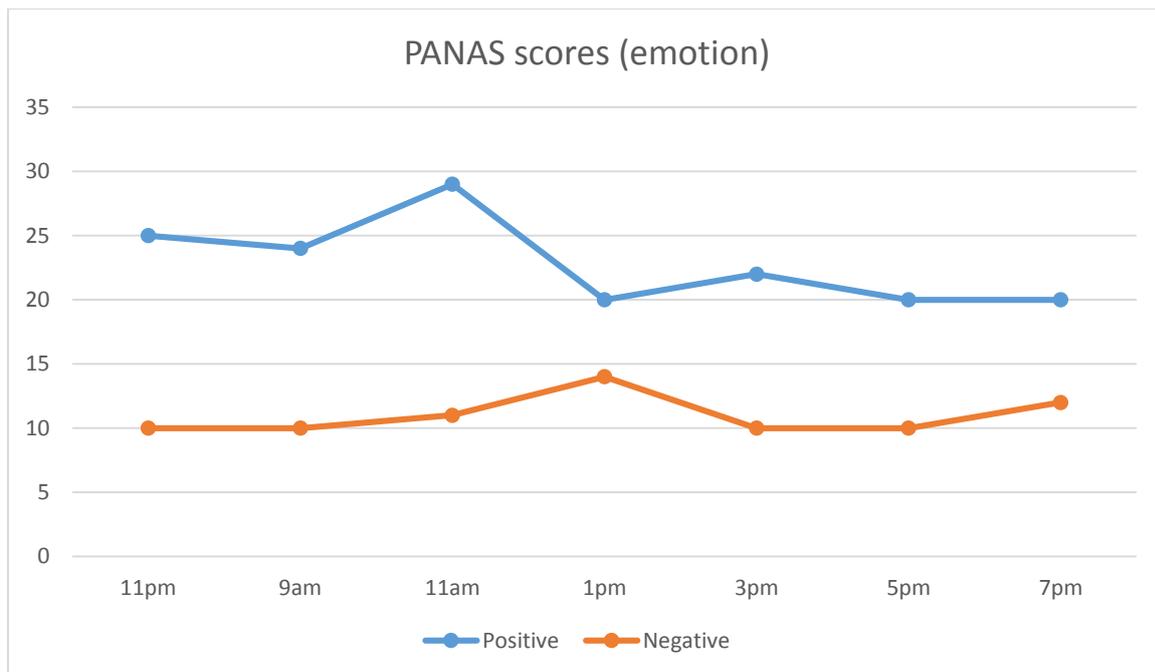
This participant's level of hunger, level of difficulty fasting, urge to eat and preoccupation with food all increased throughout the fast, suggesting a relationship between those factors. Her sense of self control was high initially, reduced in the early afternoon and then increased again towards the end, perhaps in line with the positive-negative-positive pattern she reported. Sense of pride and achievement were both relatively stable at a low level throughout the day and increased towards the end of the fast.

**Participant 10** was a 24 year old female student from the Netherlands. She had not fasted before and anticipated she would feel grumpy and lethargic throughout the fast.

BMI: 20.9

EDE-Q score: Global = 0.4625 (restraint = 1.2, eating concern = 0, shape concern = 0.25, weight concern = 0.4)

PPPQ-22 score: (persistence = 3, perseveration = 1.625, perfectionism = 3.5)



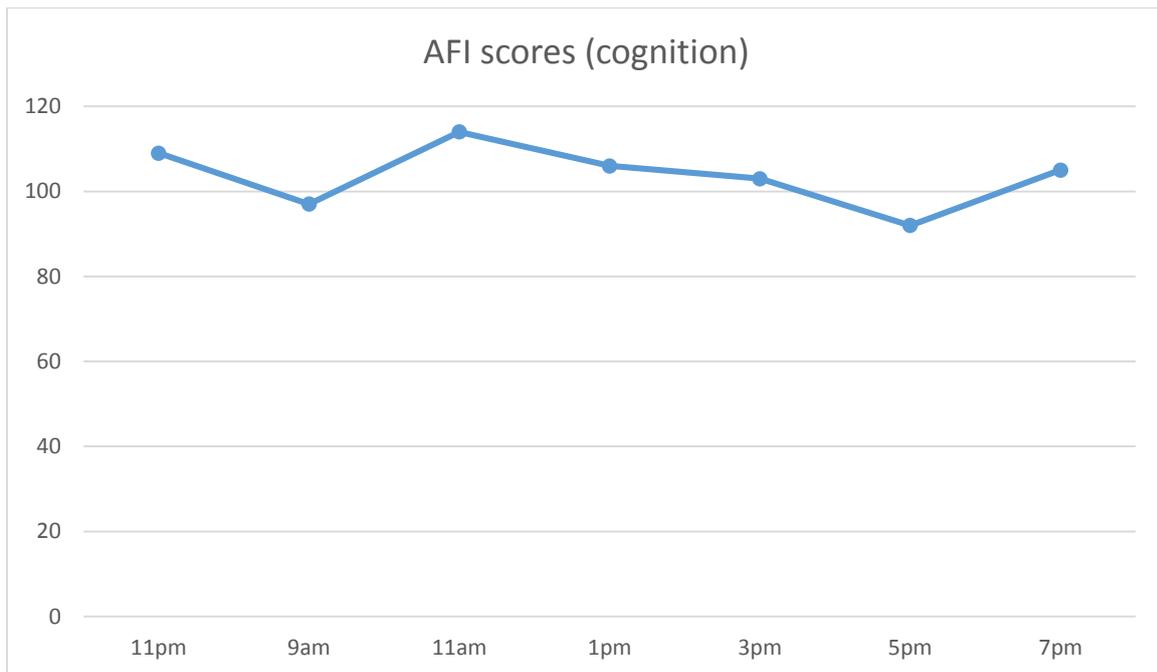
PANAS scores indicate this participant did not experience significant change in either positive or negative emotion throughout the fast. Positive emotion scores remained between 20 and 30 out of 50 with the biggest change between the time points 3 and 4. The positive emotions noted to reduce at this point were ‘interested’, ‘enthusiastic’ and ‘attentive’. Negative emotions increased marginally at time point 4 (simultaneously with the decrease in positive emotion) and at the end. The emotions accountable for this increase were ‘afraid’ and ‘nervous’.

Interview data showed that a sense of achievement made it easier for this participant to continue fasting. When discussing the hardest time for her (time point 4) she explained that it was hardest as she had not fasted long enough to gain a sense of achievement, yet there was still long time to go before completing the fast.

*“I would suppose it would have been the most difficult part of the fast around that time because there has been a few hours gone but not that many so you don’t have that sense of achievement and accomplishment yet and also because that would be the time you normally have lunch, so you’ve already had a few hours without eating...”*

She also described how she used this sense of achievement to motivate her to continue with the fast and how other positive emotions changed in accordance with this, for example a change in emotion from happy to more determined as time went on.

*“I think I used the sense of accomplishment to motivate myself towards the end of the fast so I didn’t need to think about that much any more”.*

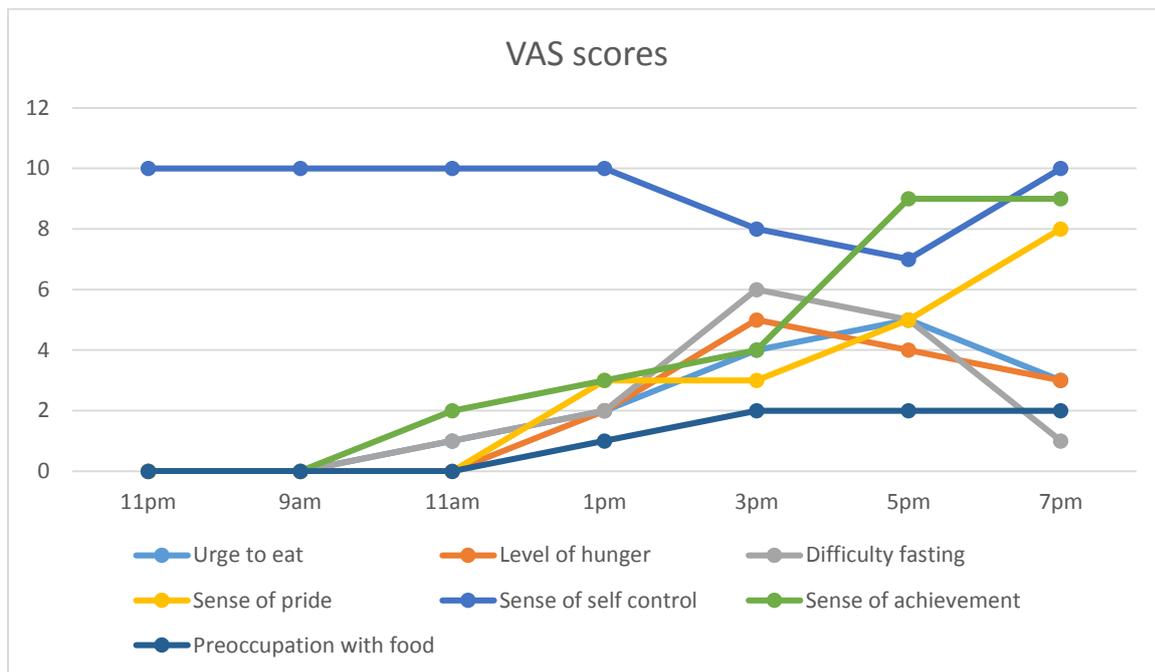


AFI scores indicate that cognitive function remained high for this participant throughout the fast. However, scores fluctuated slightly (within a 10 point range) decreasing gradually throughout the day until a final increase at the end of the fast.

During the interview the participant reported experiencing many intrusive thoughts about food. She said the level of focus and attention needed in order to block out these thoughts, and not eat, meant that she was not able to focus as well on other things.

*“A lot of my focus went, perhaps, consciously on not eating so focussing on that meant that I was able to focus on other things I was doing less at the same time”.*

She also described finding it more difficult to take in new information, harder to remember things and being less productive.



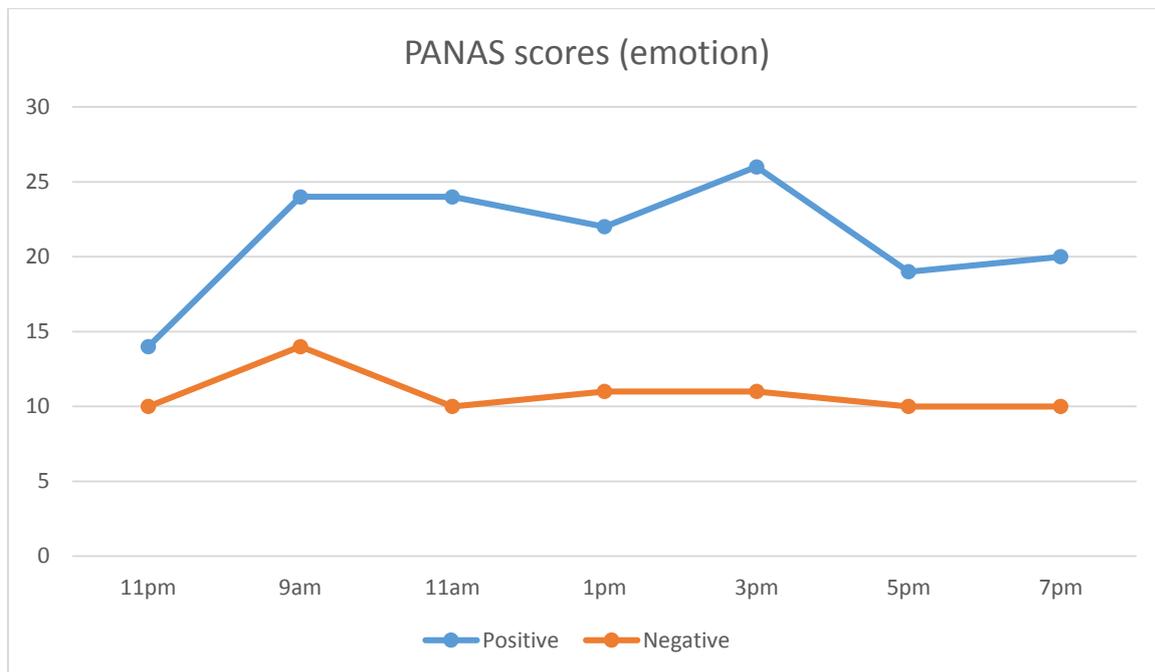
This participant's level of hunger, difficulty fasting, and urge to eat all followed the same pattern of increasing in the afternoon and then reducing towards the end of the fast. Her preoccupation with food was low in the morning and increased throughout the afternoon, however not by the same rate. Sense of self control was high initially, reduced in the early afternoon and then increased again towards the end, thus at its lowest at the time she found most difficult. Sense of pride and achievement both increased throughout the day, with sense of achievement increasing by eight points by the end of the fast. This is in line with the participant's description of what was behind her motivation to continue fasting.

**Participant 11** was a 25 year old female student from England. She had not fasted before and anticipated the fast would be difficult as she might feel irritable and down.

BMI: 18.1

EDE-Q score: Global = 0.19375 (restraint = 0.2, eating concern = 0, shape concern = 0.375, weight concern = 0.2)

PPPQ-22 score: (persistence = 4.25, perseverance = 1.875, perfectionism = 3.16)



PANAS scores indicate that positive emotion fluctuated a little for this participant throughout the day. However, from the morning of the fast until completion, these scores remained within a seven point range. Positive emotions noted to account for this fluctuation were ‘determined’ and ‘attentive’ where scores altered at each time point. Negative emotion scores began low and remained this way throughout the majority of the fast, just increasing marginally at time point two. The negative emotion accounting for this increase was ‘nervous’.

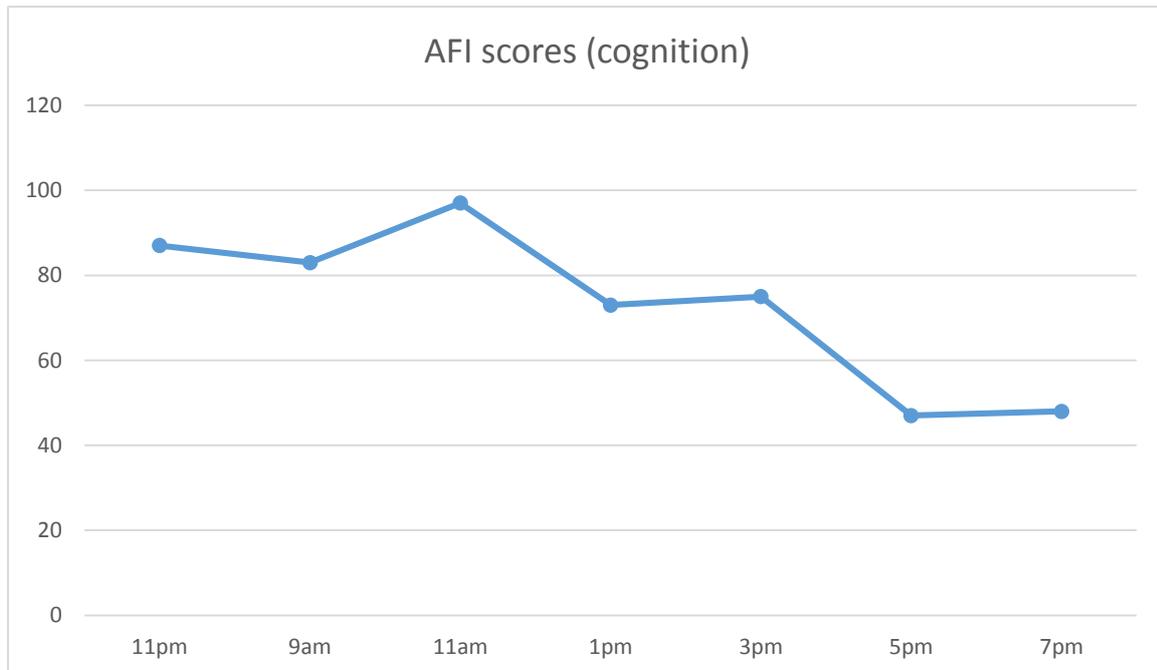
During interview this participant described feeling nervous yet determined at the start of the day which corroborates this finding.

*“I was feeling quite, yeah a little bit anxious and worried about how the day would progress but it also I was feeling quite like, yeah quite determined and like it's going to be a challenge and I was going to get stuck in with it so quite like, yeah quite curious about how it would be”.*

She reported being surprised at not having experienced any particularly negative emotions.

She also described being aware of a great sense of achievement towards the end of the fast which lasted the whole evening.

*“Yeah I think the whole of yesterday evening I felt like I’d been through this kind of thing that was difficult but I’d like got through it and so yeah it did feel like a sense of achievement I think that lasted the whole evening”*

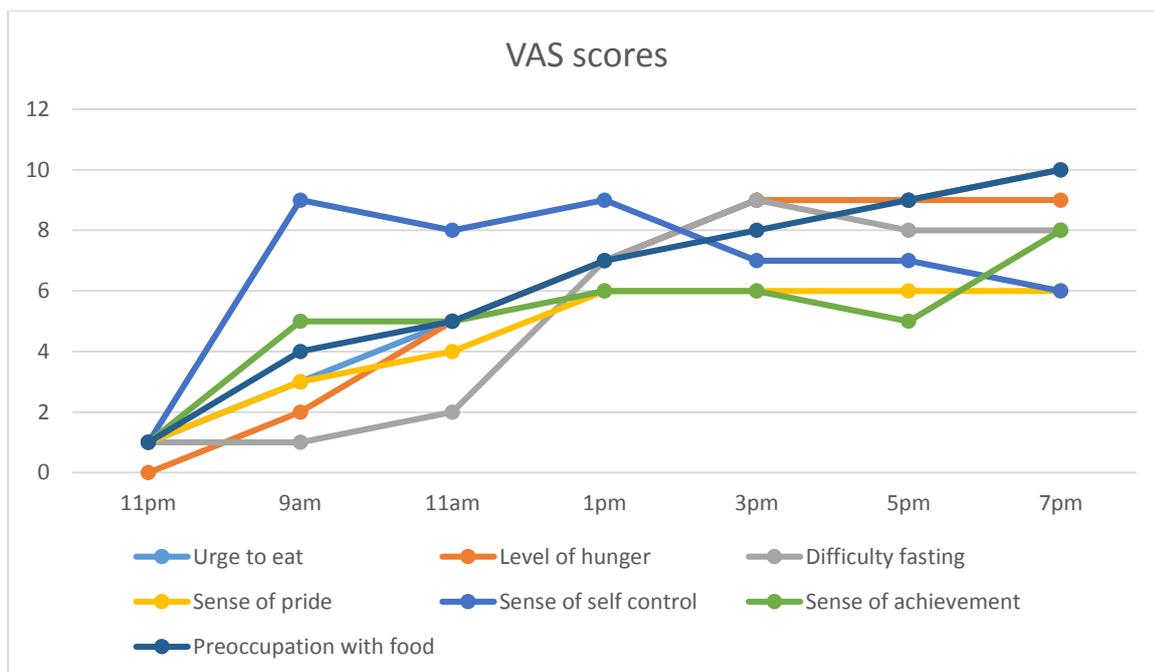


AFI scores revealed that cognitive function peaked in the morning at time point three and then gradually decreased throughout the fast. During the interview this participant described experiencing frequent intrusive thoughts and images about food, which made it difficult for her to focus on other things.

*“Yeah so like I would be thinking about other things and then somehow it would get back to food. It was this constant like reminder”.*

She reported finding it difficult to switch between tasks, make decisions, being slower to take in information and being distracted by everything. She said that her productivity was better than normal in the morning but worse in the afternoon (which is indicated in her scores).

*“Before it kind of kicked in, so between 9 and 11 I felt really productive. And then in the afternoon it was definitely a lot worse than normal, yeah”.*



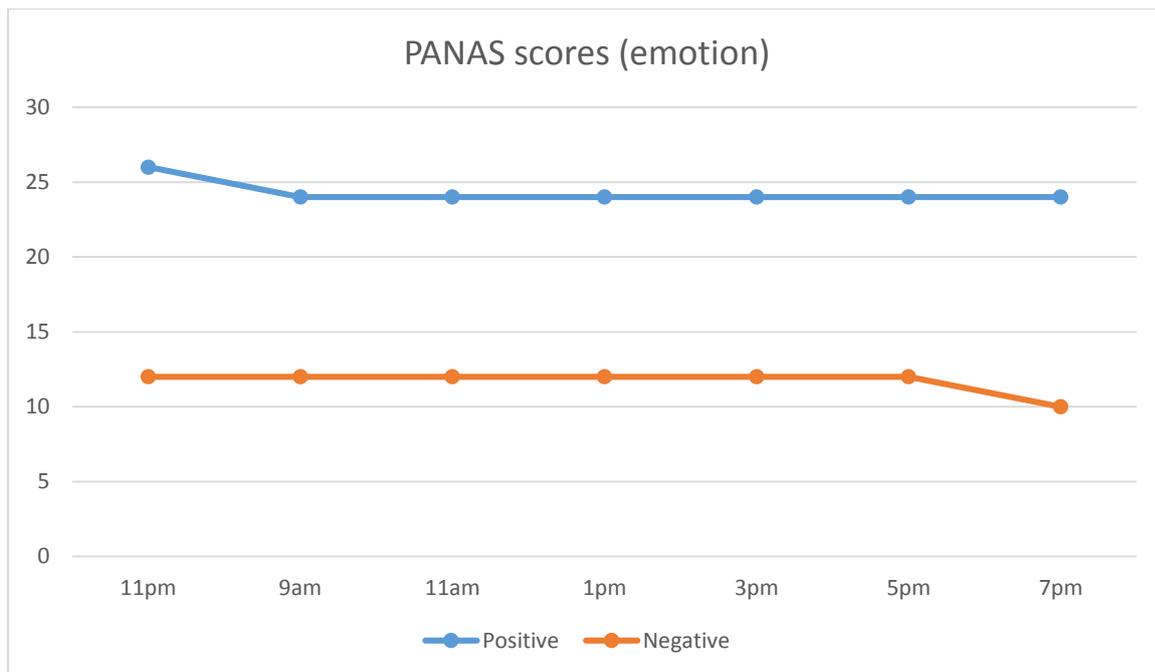
This participant's level of hunger and difficulty fasting followed the same pattern of increasing in the afternoon until time point 5 and then levelling off towards the end. However, preoccupation with food and urge to eat both increased at each time point throughout the fast which indicates that for this participant intrusive thoughts of food may not be strongly related with physical sensations of hunger and how difficult she found the fast. Sense of self control was high initially and gradually reduced throughout the fast. Sense of pride and achievement both increased throughout the day which corroborates interview data.

**Participant 12** was a 23 year old female student from China. She fasts regularly for religious reasons and anticipated the fast would be 'fine'.

BMI: 19.7

EDE-Q score: Global = 0.7625 (restraint = 0.6, eating concern = 0, shape concern = 1.25, weight concern = 1.2)

PPPQ-22 score: (persistence = 3.5, perseveration = 2.5, perfectionism = 4.16)

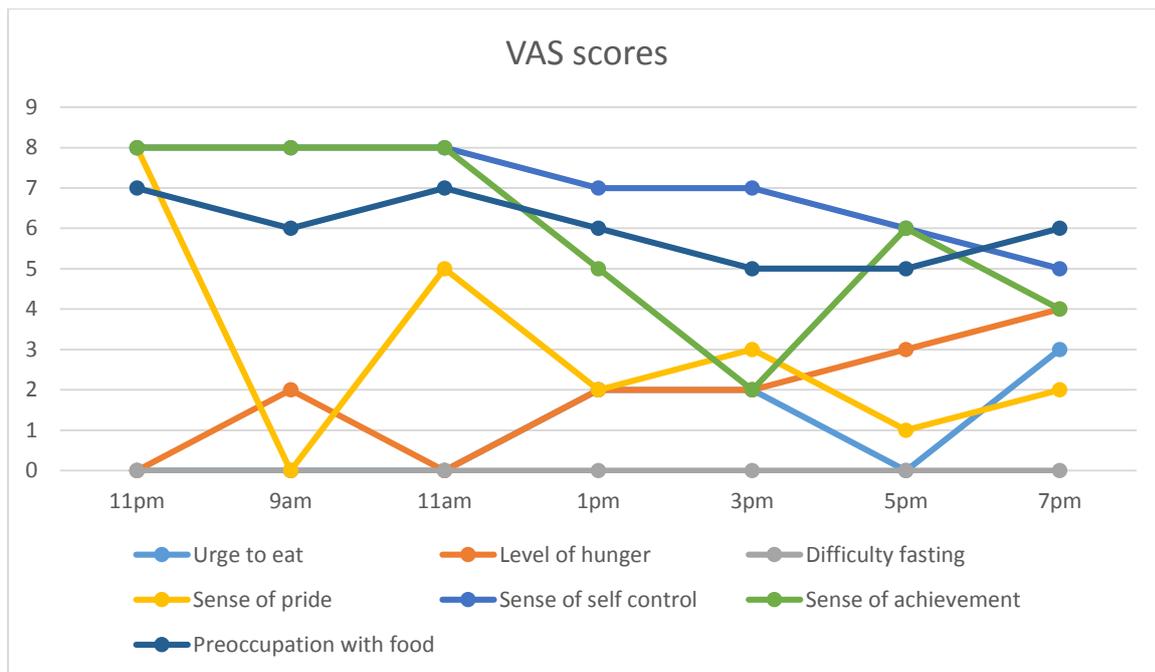


PANAS scores indicate that emotion changed very little for this participant throughout the fast. Negative scores remained low throughout the day and positive scores remained neutral (scores of 3/5 for the majority of answers).

During the interview she reported the fast to be very ‘easy’ for her and said that she forgot that she was fasting for most of the time. She thought that because she is used to fasting that it was no different to a normal day for her.

*“Feeling like just the same, just like my everyday, my routines, nothing different”.*

This participant did not complete the AFI measures and therefore EMA data regarding her cognitive function was not available. However, in the interview she reported not experiencing any difficulties regarding concentration, memory and ability to focus. She described being very focused on her work and said that her productivity was not at all affected.



This participant's level of difficulty fasting remained at 0 throughout the fast (which is in line with the interview data). It is interesting, however, that level of hunger and urge to eat both fluctuated throughout the day, and preoccupation with food scored relatively high, and yet did not seem to impact on how difficult she found it to continue fasting. Sense of self control was high initially and reduced slightly throughout the day. Sense of pride and achievement also fluctuated throughout the day.

### Thematic analysis

Analysis led to the generation of three overarching themes which incorporated nine constituent subthemes (see Table 3). Themes are described and illustrated with quotes in the section that follows.

Table 3: Table of final themes

Themes	Subthemes
<b>(A) Emotional rollercoaster</b>	Positive-negative-positive experience Sense of achievement Anticipation and excitement Anti-climax
<b>(B) Not giving up</b>	Perseverance Determination Contract
<b>(C) Blocking intrusions</b>	Behavioural strategies Cognitive strategies

### **A) Emotional rollercoaster**

A number of participants described their emotional experience as ‘going up and down’ throughout the fast. The most common pattern of emotion noted was positive-negative-positive (i.e. positive for the first few hours, negative during the middle section and positive again for the final few hours). Several participants also experienced a further negative dip once the fast was over and they had eaten.

*170312 (p12) I think I kind of expected to just feel like progressively worse throughout the day so I was actually, I was surprised by how it kind of fluctuated up and down and how actually the end was easier than the middle.*

*170315 (p4) Like, the first four hours were easy, four or five hours and after that it became a little bit more difficult as in you start to feel more hungry, but then towards the end it sort of faded as well.*

At the start of the fast participants mainly reported feeling 'neutral' in mood or quite excited, interested or determined. During the middle section the main emotions reported were feeling low in mood and irritable.

*170312 (p8) I think yeah, I was feeling quite, I wasn't feeling sad I was just feeling quite like, I don't know quite like flat I guess yeah. So kind of, quite mellow and flat and a bit yeah just quite like tired and lethargic.*

*170303 (p5) yes. I was irritable, didn't give a crap about anyone else, I couldn't, I just couldn't handle....yeah*

Several participants reported that a reduction in cognitive function affected their level of productivity, which also seemed to also impact on mood. They described feeling guilty, stressed or anxious as they felt unable to do the tasks they had set out to complete, and a number of participants reported feeling frustrated by this.

*170301 (p3) I feel a little guilty and a little ashamed because I didn't finish my reading and I have classes*

*170304 (p8) Feeling quite stressed actually just like really quite like anxious, quite like, like, kind of like I felt I had lots to do, lots of things in my mind and I just like kind of not doing any of it.*

From around 3pm, however, many participants described a shift in mood and that they became more positive. Participants attributed their heightened mood to a number of factors. The most frequently reported reason for the shift was sense of achievement.

*170312 (p11) Hmmm yeah cos I think I saw the whole day as like a challenge and like something that I was just like, I wanted to like succeed at by like reaching the end so I felt like I was really close to succeeding so it was like yeah, I felt quite like a sense of achievement.*

*170303 (p5) And then there was just like a breaking point later in the day where I felt like I just did that and I'm awesome and I wasn't as hungry and there was like an optimistic feeling and yeah.*

However, it also seems that anticipation and excitement of knowing the fast was about to end could have played a part.

*170308 (p9) I remember being quite excited about food, you know eating.*

*170312 (p10) Because I think I knew the end was coming and I was starting to get excited about eating and I was thinking about what I would eat and like planning it. So like I think I actually think I felt better than than like during the middle because I knew that it was so close to the end and I was nearly finished.*

A number of participants also mentioned the utility of having a deadline and something to count down to.

*170312 (p9) I kind of think because I knew there was a finite end to the hunger that was really like reassuring and I was aware that if I didn't know when it was going to end, like if I didn't know when I was going to be able to eat I think I would have been much more like I think I would have been much more upset about it. Cos I knew I like, I've just got to wait until 7 then it was kind of like manageable.*

*170311 (p12) The fact that I knew it was only a few hours left or at 6 is was like 45 minutes. I can do 45 minutes. To some extent I thought 45 minutes that's the time of a TV show right? Well that's not bad at all I can do this. And because I knew it wasn't much.*

Interestingly, though a number of participants described the excitement of finishing the fast, many reported a drop in mood once they had eaten. In this way food and the experience of eating was described as an anti-climax which appeared to contribute to a mood change for some participants.

*170314 (p10) Something I realised while having the meal was that the meal didn't really like match up to what I was expecting it to be. So it kind of fell short of expectations and like, yeah. The food isn't great and yeah...*

*170312 (p10) Well then it was kind of really strange, like cos I thought about it so much like, for such an intense amount of time that when I could eat it was almost like oh what was all the fuss about kind of thing. Here I am eating which is what I wanted to do all day and it almost felt a bit of anti-climax because I was so excited about eating and then when I did eat I was like oh right well this is really normal but it had become this like elusive like exciting thing.*

It seems that some participants also experienced a change in how they think about food. This may be related to some of the cognitive techniques utilized in order to manage intrusions of

food (discussed in a later theme). Participants described feeling guilty once they had eaten and trying to eat less, or being more aware of calories and trying to eat more healthily.

*170314 (p10) I stopped eating when I was like semi full. So I usually I would like have a quite a complete meal but as I was semi full I didn't feel, maybe about 70% full and then I stopped eating. And I found myself like thinking back on the food, like, that was a lot for...for, like...relatively that was quite a lot because I mean see how I didn't have anything the entire day and now I suddenly have like a massive intake of calories. It was like, ok that's a bit off. And then, I felt quite bad, I felt a bit guilty about it. Even though on a normal day it would have been a normal meal...*

*170303 (p6) You know a big turn around in terms of like what will I eat, what can I eat and that was crazy. I didn't want to eat anything unhealthy, I was like I want some carrots, I want to you know feel like really, you know, I felt a little guilty to a certain extent about what I do put in my mouth*

## **B) Not giving up**

Many participants explained what allowed them to keep going when they were having difficulty during the fast. Several participants described a feeling of determination that they began the day with and that lasted throughout.

*170301 (p7) I think I feel determined, because I think today I have planned to, I always make plans and I think I have a lot of things to do and I think it will be another very busy and very good Wednesday and I don't think I will, something will disrupt my plans.*

*170312 (p7) I was feeling quite, yeah a little bit anxious and worried about how the day would progress but it also I was feeling quite like, yeah quite determined and like it's going to be a challenge and I was going to get stuck in with it so quite like, yeah quite curious about how it would be. So, yeah...*

As a way of maintaining determination it seems a number of participants engaged in 'self-talk'.

*170304 (p10) yeah I don't know, tell myself that I've got a few hours left. Only got that then I should be able to do it.*

*170314 (p13) It got better so if...if so I wanted to like read about 4 pages and I told myself ok I'm going to get this done and I did.*

However, many participants noted that they gave up quicker than they would do normally on other tasks. Thus by putting all their determination and energy into not eating, it seems there was little left for anything else.

*170307 (p11) And I didn't want to work, and I had no, I suppose determination outside of my goal to not eat. My determination to do anything else had completely gone at that point and so I struggled for the last hour to any sort of good work.*

Along with a feeling of determination, participants described sticking to their word, i.e. when they make a plan they always stick to it. Most of the participants referred to a commitment to themselves and wanting to finish what they start.

*170308 (p9) I didn't want to give up because I don't like giving up usually. I wanted to see it till the end and see how long I did. And then by the end I was proud of myself for not eating.*

*170303 (p13) I thought I was going to break it, but I knew deep down I wasn't going to break it. [S - yeah, what was it that allowed you to keep going?]. Just when I make agreements I don't break them.*

*170315 (p6) I didn't expect the ending of the fast being so easy just because I'd already made that commitment so would have felt really silly not to go through with it.*

Whereas a few participants referred to making an agreement with the researcher and a commitment to the study which would have been hard to break.

*170315 (p10) I like to finish what I start and I just would have felt quite rubbish coming in here the day after and being like sorry I couldn't do it.*

### **C) Blocking intrusions**

The majority of participants described experiencing frequent intrusive thoughts and images about food throughout their fast. This was noted to be something that made the experience of fasting particularly difficult.

*170303 (p6) The hardest things about it was like, you know when you have a second mind in your head that's always talking was that mind, out of my mind thinking about food. It*

*was like don't think about an Elephant for a minute. It was like that. The hardest thing about the entire day was my brain.*

*170308 (p11/12) The lecture before lunchtime all I could think of was food. I mean I was listening to the lecture, I'd be looking at whatever's on the board and then just the food keeps coming in. And I was literally cooking in my head.*

Participants described a number of things (at both a behavioural and cognitive level) which they did throughout the fast in an attempt to manage this. It seems that these were strategies employed in order to try to cope with or reduce the frequency of these thoughts, or avoid them completely.

### ***Behavioural strategies***

Many participants described feeling 'tempted' by food throughout the day and that when they saw or smelt food the intrusive thoughts became worse and fasting became more difficult.

*170305 (p9) Yes, definitely. When I fast I can smell more, my sense of smell is more developed so in the class room everybody was eating so I smelt very strongly all the food so yes it remind me of food, food, food, so yeah.*

*170303 (p6) I don't know the hardest thing, there was like the hardest moment was when I walked by a restaurant that smelt sooo good.*

In order to avoid these temptations or the intrusions being triggered by cues of seeing/smelling food participants avoided places where they might be tempted such as restaurants, cafés and shops selling food.

*170304 (p9) I think, well at first I do kind of like, I do small things to kind of steer me away from food. So like I try and avoid things that I know I'd be tempted like walk through like, past certain places*

*170314 (p2) I didn't go into any cafes so, so my friends, sat like outdoors so like and environment that doesn't have temptation.*

However, this had a social impact for participants as it meant not being with friends while they were eating and therefore having to avoid social contact.

This avoidance of food was also difficult as participants described having to actively do something different from other people and from their own normal routine.

*170307 (p6) Like walking around like 12 o'clock ish, you notice everyone else is getting lunch and you aren't, you actively aren't.*

*170314 (p5) yeah, it was like, so like 9 am onwards. That's when like you know you should be doing something but you're not doing it, that's the hardest. Yes. To break away from like the norm or the usual routine. Think that was the most difficult.*

It seems that as a result some participants had to create structure in different ways to compensate for the lack of structure usually provided by eating regularly.

A number of participants used other forms of distraction as a way of taking their mind off food.

*170303 (p5) I think I wanted to be around other people because I wanted something else to think about. I mean this I just wanted to play on my phone a lot and like just, get stimulated by other things and that is kind of social media being around other people*

*170312 (p5) I think I felt when I was doing an activity I could quite, I kind of forgot the feelings of hunger and so, so when I was walking, even though I knew I was like using up energy I. it kind of took my mind of things. And when I was socialising it took my mind off things, so I think that...there was kind of times during the day that were quite easy because I was distracted by like activities.*

### ***Cognitive strategies***

In addition to these more practical avoidance techniques, many participants described employing a number of (perhaps unconscious) cognitive strategies to avoid thoughts of food and temptation to eat.

Many participants described having to change the way they think as otherwise thoughts of food would dominate.

*170312 (p3) yeah it really dominated, yeah and I guess cos usually when you're hungry you think oh ok where's the next place I can get some food, like you start planning, but then I keep having to think like ok, I have to wait until a certain time, and it was like, it was kind of*

*a mechanism that's obviously really ingrained in your brain. Like having to kind of like put it aside and think about in a different way.*

In order to do this some participants appeared to give meaning to food as 'bad' or 'illicit' which enabled them to section it off in their minds as something they were not allowed. One participant likened this to what she has already done in her mind with drugs and cigarettes as she does not want to use these substances.

*170312 (p9) It was a really bizarre sensation actually, when I was watching the film and I saw that there was food it almost felt like it was this like illicit thing. It was really bizarre, like I can't have that, but then I was like why can't I have that. It was almost like it was something illegal like there was like a split second in my brain when I was like oh but that's like not allowed, oh but it is usually. It was a really odd like, yeah it was like I don't know, like it was something yeah. Very strange.*

As a consequence of sectioning food off in one's mind, this may impact on the relationship one has with food when recommencing 'normal' eating which was discussed in an earlier theme in relation to some participants experiencing a drop in mood following eating.

Other participants described becoming 'blinkerred' and 'fixating' on other things in order to 'block out' the thoughts of food.

*170307 (p14) And also if I did try and concentrate really hard on my work I'd have to be completely absorbed in that. So you'd have to become fixated on what you were doing. So that you weren't thinking about food or...anything else.*

*170311 (p3) I was just like...yeah, so then I spent about an hour in the library and that was fine because I realised the more I concentrated on something, the less I thought about eating.*

Some participants noted that as a result their productivity and cognitive function seemed higher than normal at times during the fast. In addition, not having to stop what they were doing to buy food or eat seemed to contribute to this as well. This could be one reason for why some people experience cognitive function to improve whilst fasting.

*170311 (p6) The thing that surprised me was, for example when I was in the library, that's normally the time I'd feel like snacking and because I was so resolute not to think about*

*food and concentrating...I concentrated really well. I was really productive so maybe that, yeah, you know that moment when you're you know, 'oh I could have a snack...' that's taking time away from actually, it's interrupting your train of thoughts. So because I refused to have those thoughts, because if I start thinking about food it's never going to end. Then I just...I worked really well.*

Some participants described having to create structure to their day as food normally provides a structure.

*170304 (p8) I remember...I feel I like I kept thinking about a structure in the day. I don't know why, I mean maybe it was just because I was kind of thinking about when I could eat. But Like I kept thinking ok like, two hours and then I'll do this and I'll do that. Because usually I wouldn't really be that.*

All of the above could be considered as psychological mechanisms used by participants to cope with the fast, and in particular to manage the frequent intrusive thoughts of food they were experiencing.

## **Discussion**

The current study explored the psychological experience of fasting in healthy individuals and provides a detailed understanding of the psychological mechanisms underpinning differing experiences of fasting.

### **Emotional experience**

Emotional experiences varied greatly between individuals and across time within individuals. Whilst there were certainly reports of negative emotional states, which have been found in previous literature, such as increased irritability and low mood, there were also many reports of positive emotional experience.

In terms of positive emotion, the most common time for this to be experienced was around 3pm (when participants had been fasting for around 16 hours) and a number of participants reported an increase in positive mood which remained until the end of the fast. This was attributed to feelings of ‘pride’, ‘sense of achievement’ and ‘determination’ which increased as the fast continued. Results also showed that a number of participants experienced a further drop in mood on recommencement of eating, described by some as an ‘anti-climax’.

Therefore, results from this study show positive feelings, such as those stated above, to be experienced in healthy individuals when food is restricted. This finding supports Watkins and colleagues recent study (Watkins et al. under consideration) which was the first to find that positive feelings can be generated in short-term fasting in healthy individuals. This finding also lends support to cognitive behavioural models of anorexia nervosa which state that food restriction is partly maintained by reinforcement of positive feelings such as sense of control, power, satisfaction or pride (Fairburn, Shafran & Cooper, 1998; Schmidt & Treasure, 2006).

Furthermore, the drop in mood that was experienced by several participants following eating highlights the reinforcing quality of these emotions. This finding is particularly striking as it suggests that food restriction can be maintained by positive feelings alone, without the added reinforcing factor of weight loss. However, it is possible that some of the participants volunteered for the study because they thought they would lose weight.

A number of participants made reference to the feeling of ‘determination’ being something which helped them to get through the fast. These individuals also described themselves as being somebody who always ‘sticks to plans’, and therefore suggests that levels of determination may be linked to traits of persistence. Some participants reported that if they remained determined not to eat, this left them with little determination for other tasks. For example, finding productivity in terms of their university work was far lower than normal.

However, it seems that premorbid levels of persistence were relatively high in these individuals (demonstrated by description in interview and in PPPQ-22 scores). This lends support to the findings of Waller et al. (2012) who found that women with eating disorders have lower levels of persistence than other groups and explain this by suggesting that people with eating disorders may have premorbidly high levels of persistence, but as the disorder develops their persistence becomes focused on weight and shape and they are relatively less persistent in other areas. This idea fits with descriptions from participants in the study and shows that short-term fasting can also influence levels of persistence in healthy individuals.

### **Cognitive experience**

Experiences of cognition also varied greatly between individuals and across time within individuals. However, for the majority of participants, perceived cognitive function (seen in ability to concentrate, remember and take in information etc.) reduced over the course of the fast.

A key finding from this study is the role of intrusive thoughts about food. The majority of participants described experiencing frequent thoughts of this nature, which they reported to make the experience of fasting more difficult. Additionally, VAS data showed preoccupation with food was often connected with feelings of hunger, urge to eat and difficulty fasting.

Whilst it is not possible to say in which direction this relationship occurs, due to the methodology employed in this study, it seems that intrusive thoughts of food are inextricably linked with these more physiological factors.

The majority of participants described employing strategies to cope with such frequent intrusions of food. These strategies include avoidance of triggers at a behavioural level, such as staying away from food, and many techniques at a cognitive level. Participants described

‘changing the way they think’ to manage intrusions which included becoming ‘blinkered’ by fixating on something else so as not to allow the intrusions in and becoming very focused on the detail of things. These techniques appear to increase cognitive inflexibility and thus may provide an explanation for findings in recent fasting studies where healthy individuals have shown these deficits (Bolton et al, 2014; Pender et al, 2014). Furthermore, the increased focus on detail may be an example of increased weak central coherence.

Keys et al (1950) note that the strain of fasting voluntarily in an environment with plenty of food produces emotional conflict and therefore requires psychological mechanisms to be able to cope. It seems that one way to do this is to become ‘stuck in set’. An example of this can be seen in the current study where many participants described sectioning food off in their mind and attributing meaning to food as ‘bad’ or ‘illicit’ in order to stop them eating during the fast. A number of participants continued to view food negatively after the fast ended and reported not being able to enjoy food, not feeling hungry, feeling guilty for eating or being far more aware of calories. This suggests that even after a short-term fast, some individuals may have difficulty ‘shifting set’ back to food being ‘ok’ again. However, this could also be a more conscious process whereby participants intentionally conditioned themselves to associate food with negativity as a technique for getting through the fast, and this association was then carried over after completion of the fast. This may provide another explanation for the anti-climax experienced by many participants on recommencement of eating. If this can occur in a short-term fast, it gives us some ideas about the extent to which these mechanisms may be used in order to continue with long-term food restriction.

It would be interesting to consider whether pre-existing traits may make employing, or maintaining, the above mentioned cognitive strategies easier for some than for others. Even without a predisposition towards cognitive inflexibility findings suggest this may emerge under conditions of food restriction, and therefore could be triggered by other factors such as

dieting or illness. It seems that once these strategies are employed to initially cope with food restriction, they also act as maintaining factors, for example weak central coherence could maintain some of the features such as focus on calories at the expense of long term health.

Findings from this study also give us some ideas about the interplay between the psychological and physiological experience of fasting. As discussed earlier, intrusive thoughts about food were often linked to physical feelings of hunger (seen in VAS scores) and may be an example of Johnstone's (2006) suggestion of an interaction between food cues and psychological mechanisms. Johnstone stated that the way individuals respond psychologically to food cues may explain how experiences of food restriction differ and account for some humans being able to override physiological urges. The current study lends support to this argument as it seems that cognitive strategies were employed as a way to override physiological urges to eat. In addition, Bolton et al (2014) suggested that cognitive inflexibility is at least partially due to the biological effects of food restriction. Whilst this may be the case, the current study shows that psychological mechanisms are employed to deal with the biological effects of food restriction, rather than being a biological effect in itself and therefore psychological mechanisms may be a mediating factor in the relationship between food restriction and the physiological experience of hunger.

### **Clinical implications**

Results from the current study support previous findings that even short-term food restriction accounts for at least some of the cognitive inflexibility seen in people with anorexia nervosa. This study highlighted the role of intrusive thoughts in developing or maintaining rigidity in thinking and therefore if intrusions are still being experienced (through lack of food), re-feeding may be required in the first instance to reduce hunger, intrusions and the need to employ such cognitive strategies. It is hard to know, however, if one becomes more used to

food restriction whether over time intrusions reduce, but rigidity continues, or if intrusions will always be there. One participant in this study who fasted regularly reported very low levels of difficulty fasting, but high levels of preoccupation with food, suggesting that intrusions continue, but that she was less bothered by them as time went on.

If nutritional rehabilitation is considered the best option for individuals with anorexia nervosa this needs to be considered carefully. Re-feeding as a treatment has caused much controversy and there are issues regarding capacity and consent (Elzakkers, Danner, Hoek, Schmidt & Elburg, 2014). If this is recommended it may have to be done on compulsory basis as patients will be unlikely to agree to it. However, there is some evidence to suggest re-feeding is beneficial in the short term and that clinicians report no worsening of therapeutic relationship following compulsory re-feeding. (Elzakkers, et al 2014).

Re-feeding, however, may not be effective as a standalone treatment as even though intrusions of food should reduce, which should impact on some of the cognitive inflexibility, individuals may be 'stuck in set' by then. Pender et al (2014) suggest re-feeding may be at the core of treatment, followed by CRT to work on any lasting effects of cognitive inflexibility increased by set shifting difficulties. In addition, Waller et al. (2012) suggest that CRT is a useful approach and might be more effective if aimed at enhancing persistence and reducing perseveration. Findings from the current study lend support for both these ideas.

Finally, CBT models may also offer some useful interventions. CBT works by identifying and altering dysfunctional thinking, behaviour and emotional responses. Sidiropoulos (2007) found in a case study that CBT was helpful to restructure the strict food rules or rituals/beliefs. An example from the current study of a belief that was created to cope with the experience of food restriction and which would require challenging is 'food is elicitor'. The current study also found support for the CBT models explanation of reinforcement of positive

emotion and therefore CBT strategies around building up other parts of life to act as reinforcers and boost mood would also be beneficial. In addition, the idea that individuals feel proud after even a few hours of fasting suggests this will be a strong motivator to keep restricting food in anorexia nervosa and therefore motivational interventions, such as motivational interviewing (Miller & Rollnick, 2002) may be required to help shift these beliefs.

### **Limitations**

The design of this study was exploratory in nature. It is therefore not possible to make any causal inferences or for findings to be generalised beyond the sample. However, the results provide a rich understanding of the psychological experience of fasting to add to previous findings and inform future research. There are a number of limitations in relation to the design and methodology of the study.

The study relied in part of self-report data. Self-report data can be subject to a number of biases such as social desirability bias or participants misunderstanding questions. In this study the intention behind why participants fasted may also have influenced responses and in particular, the ability of people to comment objectively on their cognitive abilities using the AFI. However, some of this bias was reduced by obtaining additional interview data which could corroborate the self-report findings. In addition, it was not possible to check whether participants completed the EMA measures at the time point stated. Although participants were asked not to complete any missed data points retrospectively, they may have done so. However, a number of participants missed data at one or more time points, indicating that they left missed time points blank rather than completing them retrospectively.

Participants were not asked to complete measures or interviews on a non-fasting day and therefore without baseline data it is not possible to be sure that any changes to emotion or

cognition are definitely as a result of fasting. However, by collecting additional interview data participants were able provide detailed descriptions of what else was happening during the day and therefore anything else that could have contributed to a change in mood. For example, one participant described a difficult conversation with her GP which she noted to be responsible for a change in mood at that time. In addition, measures were taken at the start of the fast which can give some idea of baseline.

The EMA data consisted of VAS measures and two standardised measures of mood and cognitive function. VASs provide a simple, fast and repeatable way to obtain data at regular time points without overwhelming participants. However, participants may have different understandings of the same effective label and a particular score on a VAS may not represent the same subjective experience in two people (Aitken, 1969). This was overcome to some extent by participants repeating the measure at each time point as it is likely they would have used the same conceptualisation of the experience each time they completed it. In addition, further standardised measures and interview data were gathered as a way of triangulating data.

It was not possible to know whether participants had adhered to fasting conditions. However, detailed descriptions provided by each participant during the interview indicated that participants did fast.

Finally, there were limitations in terms of the sample used. All participants were students which may suggest that as a group they are hard working and of higher intelligence than the general population. In addition, a number of participants were Chinese or Japanese. Although all participants were fluent English speakers, if English was the second language it may have led to misunderstanding or error in completing some of the questionnaires. In addition, these participants may be influenced by cultural differences in values, for example in relation to

expectations of achievement (Lai, 2000), which could have an effect on responses. However, these participants were living in the UK and therefore also likely to be influenced by Western cultural ideals.

### **Strengths**

The strengths of this study must also be acknowledged. Using a mixed methods design allowed for a deeper understanding of the participant's psychological experience. The EMA data provided detailed information about change over time for each participant. Both VAS and standardised measures were used to ensure data was as reliable as possible, whilst not overwhelming participants having to complete measures every two hours. In addition, the qualitative data was used to both corroborate findings from the EMA data and also provide richer descriptions of experience which could begin to answer the 'why' and give an understanding of the mechanisms behind some of the changes found. Interview data was more reliable as participants were asked to record a few minutes of qualitative data at each time point to jog their memories. Detailed information from each participant was gained, along with as an overview of common patterns amongst participants in the thematic analysis.

### **Future research**

This study provides detailed description of the psychological experience of fasting and highlights a number of mechanisms used by individuals to cope with food restriction, which appear to be responsible for some of the cognitive inflexibility found. Due to the methodology employed, however, it is not possible to generalise these findings beyond the sample and therefore employing a quantitative design, with a larger N would be beneficial.

This research could address the following areas:

- Whether the amount or frequency of intrusive thoughts an individual experiences is associated with the level of cognitive inflexibility (i.e. weak central coherence/set shifting difficulties) they experience when fasting.
- Further exploration of the role of intrusive thoughts of food over time. For example whether these reduce, yet inflexibility continues, or whether intrusions remain as long as food is restricted. A longitudinal design would be beneficial here, however, there are many ethical difficulties associated with this.
- Further exploration of the links between psychological mechanisms and how these relate to the physiological experience of hunger. For example, from this study one might hypothesise about intrusions mediating relationship between physical symptoms and difficulty fasting, however this would need to be tested.

In addition, in order to limit self-report bias, asking participants to complete behavioural tasks at two hourly time points throughout a fast, on areas such as memory and reaction time, would be beneficial. This may also help to explain some of the inconsistent findings in the Benau et al. (2014) review.

## **Conclusions**

This study was a mixed methods exploration of the psychological effects of fasting. Findings suggest that a number of psychological mechanisms are employed by healthy individuals in order to cope with the experience of fasting which impact on cognitive flexibility. Once these strategies have been developed it might be harder for some individuals to recommence eating for a number of reasons including increased weak central coherence, being ‘stuck in set’ and reinforcement of positive emotions. These findings were produced in a healthy sample suggesting that some of the cognitive and emotional features found in people with anorexia

nervosa are likely to be related to starvation and not solely pre-existing traits or features of the disorder. This has considerable implications for the treatment of anorexia nervosa and in terms of unintentional food restriction leading to anorexia nervosa. However, not all healthy individuals go on to develop eating disorders and therefore having a predisposition may make one even more susceptible to the maintaining factors described above and may explain why some go on to develop eating disorders whilst others do not.

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### **Part 3: Critical Appraisal**

This appraisal will reflect on the process of designing and undertaking the above research. It will firstly include discussion of the literature review and what conducting a systematic review has taught me. It will then comment on the empirical paper including the choice of topic, and any assumptions this may have brought, implications of using a fasting paradigm and methodological issues. Finally reflections are made on both the process of carrying out the research and on the findings.

### **Literature review**

My interest in exploring the relationship between social media and body image stems from my work in child and adolescent services. During my work in this field I became aware of how much time young people spend on social media and the influence (both positive and negative) this can have. It seems that in society today there is a 'moral panic' about the influence of social media. Turner discusses this in relation to previous panics about other new forms of media, e.g. television and radio (Turner, 2014). I therefore felt it was important to explore the evidence, rather than make judgements based on hearsay and what is written in the press. As a result I wanted to explore the true extent to which body image may be effected by social media and whether this is at a greater level than other media influences.

Whilst there is limited evidence and much of this is not methodologically sound, the picture does not seem as bad as the mass media may have us believe. No evidence was found that social media is causing an increase in eating disorders. However, it is of concern that there was an association between time spent on social networking sites and increased body dissatisfaction, a risk factor for developing an eating disorder. The two main features which appeared to be responsible for this association were 'photo sharing' and 'commenting'. It seems that comments about weight have always been present for young people, for example

in the school playground in the form of ‘fat-talk’ (Taniguchi & Lee, 2012) and perhaps social media is just another arena for this to take place. However, if this is the case there may be an increase in frequency or likelihood for young people to be subject to such discussions, as commenting on social media can occur 24 hours a day, rather than being confined to the hours of school. What is more striking, however, is the feature of ‘photo sharing’. This is a relatively new phenomena and gives young people far more scope for evaluating self and others in visual form. This again creates more opportunity for comparison between individuals and for idealised norms to be created due to individuals only posting images that they deem acceptable. However, beyond the scope of the literature review lies a body of research pertaining to the potential benefits of social media in terms of support groups for people with mental health difficulties and eating disorders which makes seeking help more accessible (Caplan & Turner, 2007; Burleon & Goldsmith, 1998; Ellison, Steinfield & Lampe, 2007; Shaw & Gant, 2002). It is therefore imperative that any risks associated with social media, in terms of body dissatisfaction, are balanced with the potential benefits.

The process of undertaking the systematic literature review has raised my awareness of methodological issues and encouraged me to take a more critical stance when considering research. This includes questioning findings and considering potential biases along with transferability to the ‘real world’ or the relevant clinical setting. In addition, this process has allowed me to reflect on my own research differently as I now have a greater appreciation of the methodological dilemmas and limitations that are inevitable for any study.

## **Empirical paper**

### **Rationale**

The area of fasting and anorexia nervosa was of interest to me for a number of reasons. I have worked with a number of people clinically who have eating disorders and have found this experience to be somewhat frustrating in relation to the high level of treatment resistance. Anorexia nervosa has also been found to have the highest mortality rate among all mental health problems (Hoek, 2006), and its incidence has risen in the at risk group of fifteen-to-19 year old females (van Son, Hoeken, Bartelds, van Furth, & Hoek, 2006). In addition, I have personal experience of fasting for religious reasons. Through discussions with friends and family about their experiences of fasting, I was aware of the differing experiences individuals have of being able to cope without food and have always been interested in this. I therefore wanted to use my interest in fasting to contribute to literature about anorexia nervosa as a way to help to identify routes to prevention and intervention.

### **Assumptions**

It is acknowledged that researchers bring their own assumptions to research which reflect their experiences, values and beliefs, and that these will inevitably influence their work (Preissle, 2008). I have fasted once a year for approximately 20 years for the religious festival of Yom Kippur. This fast involves restricting both food and drink for 25 hours and is an experience I find very difficult. However, I have also noticed a sense of achievement on completion of the fast.

On reflection I wonder whether my beliefs about fasting may have influenced my ideas about how difficult participants would find the fast, and whether 20 hours was long enough to find any effects, particularly given I am used to fasting for a longer period and not being able to

drink water. These ideas may have also influenced the questions I asked during interview and the areas I wanted to explore in the study. However, the planning of the study was also based on previous research and I was aware that fasting for religious reasons is a very different experience to fasting for an experiment. In an attempt to reduce bias these assumptions were acknowledged in the empirical paper, through use of the Subjectivity Statement (Preissle, 2008), and attempts were made to 'bracket' them throughout the project (Barker, Pistrang, & Elliott, 2002). I also strived to be transparent throughout, and hope that I produced a rich, detailed account of the experience of fasting which was as limited in researcher bias as possible. In addition, the use of EMA data in addition to qualitative data meant that the analysis was not reliant on my interpretation, as the EMA data would be less subject to researcher bias.

### **Fasting paradigm**

One of the strengths of the study was its experimental nature, whereby fasting was used to explore what happens to individuals when food is restricted. However, it was not possible for me to check whether participants had strictly adhered to fasting conditions. It seems from the detail received during interviews that participants did complete the fast, although it is possible they could have been describing a different experience of fasting or giving false answers. Another of my concerns about the fasting paradigm was the overlap between physiological and psychological effects of fasting. It was difficult to know how physiological effects of fasting, for example, low blood sugar, might be impacting on emotional or cognitive experience. Dwyer, Horton, & Aamodt (2011) suggest that physiological responses to fasting play a significant role, whereby individuals with anorexia nervosa have an altered regulation of their starving response, including reduced appetite even after fasting, which contributes to the maintenance of the disorder. This may provide a more physiological explanation for why some participants did not feel hungry following the fast and experienced

the feeling of ‘anti-climax’. However, it seems from my results that some of the psychological experiences found may have been as a result of mechanisms used to endure the physiological experience. In addition, the ethical dilemmas of asking people to fast for 20 hours must be considered. I was aware from personal experience that hunger can be an unpleasant experience and therefore it felt important to offer a monetary reward to participants for their contribution. Previous research has indicated that fasting itself can contribute to the development of EDs (Dwyer, Horton, & Aamodt, 2011) in susceptible individuals. This potentially raises serious ethical concerns about this study. However, participants were asked to fast for a relatively short period of time, and several had already fasted for periods of this length previously. In addition, initial measures were carried out to detect individuals who may be most susceptible to the development of an eating disorder and one participant was excluded on this basis. The reasons why individuals volunteered to participate in this research also need to be taken into consideration. Participants were asked about their reasons for participating during the screening. The majority stated it was for the money and a number of participants said it was because they found the topic to be of interest. However, it is possible that participants who like fasting, who do not find fasting a terribly unpleasant experience, or who wanted to lose weight may have been attracted to the study. The reasons for fasting may also have influenced findings. For example, somebody who fasts regularly or wishes to lose weight from fasting may have a vested interest in showing that it has little negative effect. It is important that this is kept in mind when considering findings. Finally, knowing the fast had a finite time limit may have impacted on the results of this study. A number of participants noted during interview that they were ‘counting down’ to the end of the fast, and this may have influenced their affective experience. If participants did not know how long the fast would last this may have changed the experience, particularly in relation to the positive-negative-positive experience reported. Furthermore, knowing that the

fast is going to end at a certain time is very different to the experience of food restriction in anorexia nervosa and therefore needs to be kept in mind when relating findings to the disorder.

### **Use of small-N design**

The decision to use this design was based on the idea that when using nomothetic data individual variability can get lost and aggregated characteristics of the group may bear little relation to the individuals within the group. Using an ideographic approach can address these difficulties as the focus is on individual uniqueness and complexity, which was the aim of my study, and therefore it seemed most appropriate to use an ideographic approach. However, one design limitation of this study is that we cannot be certain that change occurred due to the fast, because a full baseline measure was not taken. This was considered during the planning stages of the study. However, it was thought that to ask participants to complete measures every two hours on a non-fasting day in addition to fasting, completing measures every two hours and attending an interview would require a higher level of financial compensation and this was not possible within the confines of this study. A compromise was sought in that a baseline measure was taken at the start of the fast (when the effects of food restriction would not have been present), however this was late in the evening. In addition, Elliott (2002) provides guidance on demonstrating that change has occurred and suggests administering more than one measure and using a qualitative approach to establish plausibility. This study did both of these, and therefore whilst there is limited baseline data to compare with, there is good qualitative evidence that change occurred and that it was as a result of the fast.

### **Data gathering**

One of the strengths of the study's design was the collection of data every two hours throughout the fasting period. Asking participants to provide data at certain time points meant that detailed regular data was collected throughout fasting which allowed for tracking of change over time within individuals. Participants also completed the measures in their natural environments rather than in a laboratory setting, which increased ecological validity.

However, there was a concern that some participants may have retrospectively completed

measures. Stone & Shiffman (1994) suggest prompting participants to provide data at given time-points with the use of an electronic signalling device such as a pager, or palmtop computer. Due to insufficient funding it was not possible to purchase any equipment, however I set up a text reminder system whereby participants received a text message on their mobile phone at each time point which contained a link to a questionnaire, containing the EMA measures, which had been created online. The aims of this were to remind participants to fill in the measures at each time point and to make the experience of completing such frequent measures easier as they could be completed on a mobile phone. In addition, participants were asked to leave incomplete data points blank rather than retrospectively filling them out. Participants appeared to have followed these instructions as a number of them had incomplete time points. However, there was no objective means of checking this.

Furthermore, the collection of qualitative data during interview provided an opportunity to validate EMA data and gain a richer understanding. However, the decision of when to carry out the interview caused a dilemma. I eventually opted to interview participants the morning following the fast. This was more feasible in terms of practically arranging the interview times and not expecting participants to travel in the evening. It also allowed me to ask participants about their experiences once they had eaten again, which provided some very useful information. However, it may have been more difficult for participants to remember their experiences clearly the following day and once having eaten again participant's views of their experience may have changed. Attempts were made to counter this by asking participants to record a few minutes of qualitative data at each time point as a memory aid.

### **Self-report**

This study utilised self-report data through use of both questionnaire and interview in order to directly access participant's thoughts and feelings. The use of both formats was beneficial as the interviews allowed for greater flexibility, more complex questions and follow up, whilst questionnaires provided a higher level of reliability due to being standardised. However, there are a number of drawbacks to relying on self-report data. There may be memory or attributional biases, social desirability effects may be present and the reason for why participants were doing the fast could have influenced their responses as discussed earlier. There may also be lack of conscious awareness, for example it might have been difficult for participants to accurately comment on their cognitive abilities using the AFI or during interview. Future research would therefore benefit from incorporating some behavioural measures of cognition alongside self-report.

### **Use of a non-clinical sample**

I chose to recruit a non-clinical sample as this allowed more scope for separation of the effects of short-term fasting from the effects of chronic starvation that would be present in clinical samples. This meant that findings could contribute to disentangling the effects of starvation from the overall picture of anorexia nervosa. Recruiting a non-clinical sample also allowed for ease of recruitment. However, there were some limitations to the use of a non-clinical sample, namely in that the research did not allow for comparison with individuals with anorexia nervosa. If participants had been both healthy individuals and individuals with anorexia nervosa, this may have given us some ideas about which features transcend the experience of food restriction and may be more indicative of the phenomenology of anorexia nervosa itself. In the planning of this study I considered recruiting a mixture of healthy participants and participants with anorexia nervosa. However the ethical implications of potentially encouraging food restriction in individuals with anorexia nervosa were not feasible for a study of this nature. In addition, recruiting a sample of young, female participants may be seen as beneficial as this

represents the group most at risk of developing anorexia nervosa. However, this may also limit the generalisability of the findings to a well-educated, female population, therefore, future studies may benefit from recruiting a more educationally and socio-economically diverse sample.

### **Personal reflections**

Whilst I had some initial reservations about how much a fast of 20 hours could reveal about emotion and cognition, I was very pleased with the outcome of the study. The findings provide a detailed description of the psychological experience of fasting and can tell us something about the mechanisms used by participants to cope with the experience, which adds to previous literature. It also lends support to a number of models of anorexia nervosa and suggest routes for intervention. In the future it would be beneficial to expand on this study by looking further into the role of intrusions and how they are managed by individuals who are restricting food. On a personal level I feel privileged to have more insight into why people with anorexia nervosa may become so fixed on restricting food and treatment resistant.

In addition, throughout this process I have learned a great deal about conducting research. I understand that it is a process of dilemmas and decision making and that one needs to balance the search for interesting findings with the need to be pragmatic.

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## **Appendix A: Recruitment poster**



## **Appendix B: Screening questionnaire**

Age	
Are you pregnant?	
Do you have any other any health conditions that may make fasting dangerous e.g. diabetes?	
Have you have ever had an eating disorder?	
Do you have any mental health difficulties at the moment?	
How would you like reimbursing (course credits/money)?	

How many meals a day do you normally eat?	
Roughly what time do you eat these?	
Have you ever fasted before (for religious/spiritual reasons, dieting etc.)?	
How do you anticipate that you will find the fast?	
What is your key motivation for participating in this study?	
How do you feel about your body?	

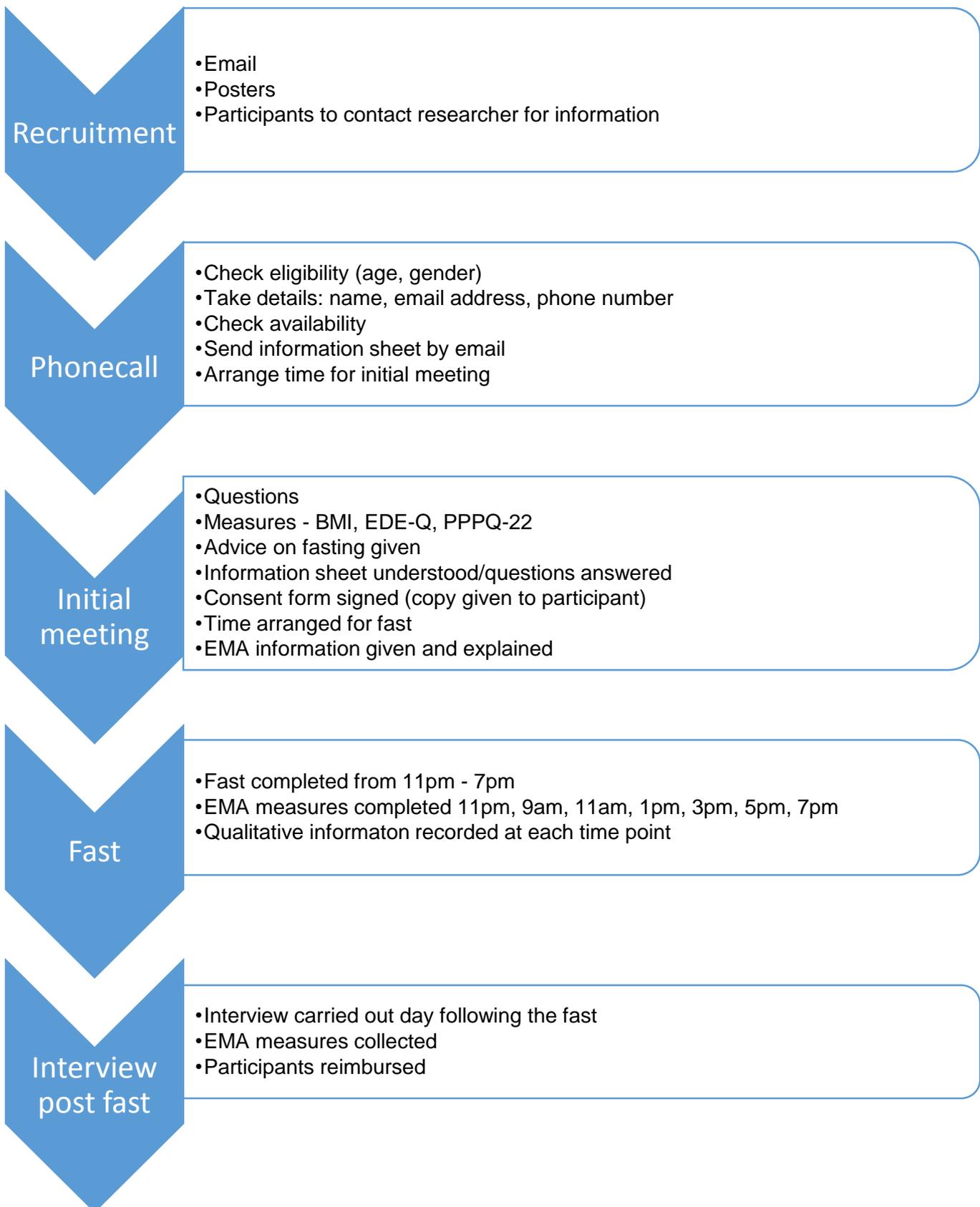
BMI score	
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EDE-Q score	
PPPQ-22 score	

Advice sheet on fasting given?	
Information sheet read and understood by participant?	
Consent form signed?	
Time arranged for fast and follow up interview?	
EMA pack and explanation given?	

## **Appendix C: Study protocol**

## Study protocol



## **Appendix D: Information sheet**

## Information Sheet for

## in Research Studies

**You will be given a copy of this information sheet.**

Title of Project: **A mixed methods study of the psychological effects of fasting**

This study has been approved by the UCL Research Ethics Committee (Project ID Number): 5374/001

Name Sophia Bergen  
Work Address 1-19 Torrington Place, London, WC1E 7HB  
Contact Details [s.bergen@ucl.ac.uk](mailto:s.bergen@ucl.ac.uk), 07817308355

We would like to invite \_\_\_\_\_ to participate in this research project.

### **Details of Study:**

This study focuses on understanding the different ways people can feel when they have not eaten. We are interested in finding out how emotions are affected and whether people find it a difficult or rewarding process. We are also researching the effects of any cognitive processes and whether people's ability to think clearly is affected by lack of food.

### **What will happen if I take part?**

You will be contacted by the researcher to explain a bit about the study and answer any questions you may have. If you are interested in going ahead you will be invited to a screening interview where you will be asked to complete some questionnaires, given full information about the study (both written and verbally) and asked to sign a consent sheet.

The next stage of the study is for you to complete a 20 hour fast from 11pm to 7pm the following day. During this time you will be asked to complete some short questionnaires every 2 hours, along with a few minutes of qualitative information on how you are finding the experience. Once your fast is complete you will meet with the researcher again who will collect your data and interview you for around an hour about your experience of fasting. The date of the fast and interview will be arranged with the researcher during the initial screening.

### Summary

1. Information received from researcher

2. Screening interview and questionnaires
3. 20 hour fast – completion of short questionnaires every 2 hours (during waking hours) and recording qualitative information
4. Debrief, data collection and qualitative interview about your experiences

**What are the possible disadvantages and risks of taking part?**

It is possible that during the fast you could experience some discomfort as a result of being hungry. It is important that you consider the potential effects of fasting before you agree to participate. The study may also cause emotional distress; should this be the case we will provide you with information on how to access support. If you have concerns about any aspect of this project you should contact Sophia Bergen.

**What are the possible benefits of taking part?**

There are no direct benefits to you of taking part; however some people find fasting to be a positive experience. We also hope that the knowledge gained from this study will be of help to you and other people in the future.

**Will my taking part in the study be kept confidential?**

Yes your confidentiality will be safeguarded during and after the study which is conducted in accordance with the Data Protection Act 1998. An identification code will be allocated to you so that your data are kept anonymous. The information we collect from questionnaires will be recorded and put into an electronic database using this code rather than your name. Recorded interviews will be transcribed, using this code, and the tape will then be wiped clear.

The data will be used for research purposes only and only be analysed by the researcher. The data will be disposed of in a secure manner on completion of the study. No information about you will be disclosed to a third party.

**What will happen to the results of the research study?**

A summary of the findings will be offered to all participants. The data and results from this study may be published in medical journals or scientific reports. All data will remain anonymous so that it is not possible to identify anybody who has taken part.

**Who is organising and funding the research?**

The principle researcher, Dr Lucy Serpell, is organising the research which is sponsored by University College London (UCL).

**Who has approved this study?**

This study has been approved by the UCL Research Ethics Committee and has been registered with the UCL Data Protection Officer.

**Further information and contact details:**

Sophia Bergen, Research Department of Clinical, Educational and Health Psychology, UCL, Gower Street, London, WC1E 6BT

Please keep this leaflet for your information.

Please discuss the information above with others if you wish or ask us if there is anything that is not clear or if you would like more information.

It is up to you to decide whether to take part or not; choosing not to take part will not disadvantage you in any way. If you do decide to take part you are still free to withdraw at any time and without giving a reason.

**All data will be collected and stored in accordance with the Data Protection Act 1998.**

## **Appendix E: Advice sheet**

### **Participant advice and instructions for fasting**

You are asked to fast before your interview.

It is important that you follow the instructions given to you in order to:

- i) Ensure your safety
- ii) Make sure that the results of the study are valid

#### **Advice**

Please do not fast if you have diabetes, there is a possibility that you are pregnant, you have problems with your blood sugar, have been advised to not fast by a medical professional or have any other health conditions that may put you at risk if you fast. Please also do not fast during a period when you will be driving, operating heavy machinery or doing dangerous activities.

While you are fasting your blood sugar may decrease, you may feel hungry, have a headache, experience slight nausea or heartburn. You may also feel lower in mood, find it hard to concentrate or feel irritable.

#### **Instructions for fasting**

- i) Two days before your interview on \_\_\_\_\_ please eat as normal and then fast between 11pm and 7pm the following day. Your interview will take place the day after this.
- ii) During fasting you may only drink water. Please do not eat any food, or drink any caffeinated drinks such as tea or coffee or any sugary drinks such as coke.
- iii) When you are fasting do not drink any alcohol.
- iv) It is common to feel slightly faint when fasting but if you feel very faint or are concerned about any symptoms you are experiencing then please stop fasting immediately and eat something.
- v) Throughout fasting please ensure you drink lots of water to prevent dehydration.

**During waking hours you will receive a text reminder to complete a short questionnaire every 2 hours.**

**Appendix F: Informed consent sheet**

## Informed Consent Form for

## in Research Studies

**Please complete this form after you have read the Information Sheet and/or listened to an explanation about the research.**

Title of Project : **A mixed methods study of the psychological effects of fasting**

This study has been approved by the UCL Research Ethics Committee (Project ID Number): 5374/001

Thank you for your interest in taking part in this research. Before you agree to take part, the person organising the research must explain the project to you.

If you have any questions arising from the Information Sheet or explanation already given to you, please ask the researcher before you to decide whether to join in. You will be given a copy of this Consent Form to keep and refer to at any time.

### **Participant's Statement**

I

- have read the notes written above and the Information Sheet, and understand what the study involves.
- understand that I must not participate if I have a diagnosed eating disorder or a health condition that may make it dangerous for me to fast (e.g. diabetes, pregnancy).
- understand that should I feel unwell due to fasting I am free to stop fasting immediately and eat something.
- understand that if I decide at any time that I no longer wish to take part in this project, I can notify the researchers involved and withdraw immediately.
- understand that my participation will be tape recorded and I consent to use of this material as part of the project.
- consent to the processing of my personal information for the purposes of this research study.
- understand that information from this study may be published. Confidentiality and anonymity will be maintained and it will not be possible to identify me from any publications.
- understand that such information will be treated as strictly confidential and handled in accordance with the provisions of the Data Protection Act 1998.
- agree that the research project named above has been explained to me to my satisfaction and I agree to take part in this study.

Signed:

Date:

## **Appendix G: Statement of ethical approval**



**UCL RESEARCH ETHICS COMMITTEE  
GRADUATE SCHOOL OFFICE**

Dr Lucy Serpell  
Department of Clinical Psychology  
UCL

2 May 2014

Dear Dr Serpell

**Notification of Ethical Approval Project ID: 5374/001: A mixed methods study of the psychological effects of fasting**

I am pleased to confirm that your study has been approved by the UCL Research Ethics Committee for the duration of the project i.e. until June 2015.

Approval is subject to the following conditions:

1. You must seek Chair's approval for proposed amendments to the research for which this approval has been given. Ethical approval is specific to this project and must not be treated as applicable to research of a similar nature. Each research project is reviewed separately and if there are significant changes to the research protocol you should seek confirmation of continued ethical approval by completing the 'Amendment Approval Request Form'.

The form identified above can be accessed by logging on to the ethics website homepage: <http://www.grad.ucl.ac.uk/ethics/> and clicking on the button marked 'Key Responsibilities of the Researcher Following Approval'.

2. It is your responsibility to report to the Committee any unanticipated problems or adverse events involving risks to participants or others. Both non-serious and serious adverse events must be reported.

### **Reporting Non-Serious Adverse Events**

For non-serious adverse events you will need to inform Helen Dougal, Ethics Committee Administrator ([ethics@ucl.ac.uk](mailto:ethics@ucl.ac.uk)), within ten days of an adverse incident occurring and provide a full written report that should include any amendments to the participant information sheet and study protocol. The Chair or Vice-Chair of the Ethics Committee will confirm that the incident is non-serious and report to the Committee at the next meeting. The final view of the Committee will be communicated to you.

### **Reporting Serious Adverse Events**

The Ethics Committee should be notified of all serious adverse events via the Ethics Committee

Administrator immediately the incident occurs. Where the adverse incident is unexpected and serious, the Chair or Vice-Chair will decide whether the study should be terminated pending the opinion of an independent expert. The adverse event will be considered at the next Committee meeting and a decision will be made on the need to change the information leaflet and/or study protocol.

On completion of the research you must submit a brief report (a maximum of two sides of A4) of your findings/concluding comments to the Committee, which includes in particular issues relating to the ethical implications of the research.

With best wishes for your research.

Yours sincerely



**Professor John Foreman**  
**Chair of the UCL Research Ethics Committee**

Cc: Sophia Blakey, Applicant

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**Appendix H: The Eating Disorders Examination Questionnaire (EDE-Q)**



### Eating Disorder examination questionnaire (EDE-Q 6.0)

Instructions: The following questions are concerned with the past four weeks (28 days) only. Please read each question carefully. Please answer all the questions. Thank you.

Questions 1 to 12: Please circle the appropriate number on the right. Remember that the questions only refer to the past four weeks (28 days) only.

	ON HOW MANY OF THE PAST 28 DAYS ...	NO DAYS	1-5 DAYS	6-12 DAYS	13-15 DAYS	16-22 DAYS	23-27 DAYS	EVERY DAY
1	Have you been deliberately <b>trying</b> to limit the amount of food you eat to influence your shape or weight (whether or not you have succeeded)?	0	1	2	3	4	5	6
2	Have you gone for long periods of time (8 waking hours or more) without eating anything at all in order to influence your shape or weight?	0	1	2	3	4	5	6
3	Have you <b>tried</b> to exclude from your diet any foods that you like in order to influence your shape or weight (whether or not you have succeeded)?	0	1	2	3	4	5	6
4	Have you <b>tried</b> to follow definite rules regarding your eating (for example, a calorie limit) in order to influence your shape or weight (whether or not you have succeeded)?	0	1	2	3	4	5	6
5	Have you had a definite desire to have an <b>empty</b> stomach with the aim of influencing your shape or weight?	0	1	2	3	4	5	6
6	Have you had a definite desire to have a <b>totally flat</b> stomach?	0	1	2	3	4	5	6
7	Has thinking about <b>food, eating or calories</b> made it very difficult to concentrate on things you are interested in (for example, working, following a conversation, or reading)?	0	1	2	3	4	5	6
8	Has thinking about <b>shape or weight</b> made it very difficult to concentrate on things you are interested in (for example, working, following a conversation, or reading)?	0	1	2	3	4	5	6
9	Have you had a definite fear of losing control over eating?	0	1	2	3	4	5	6
10	Have you had a definite fear that you might gain weight?	0	1	2	3	4	5	6
11	Have you felt fat?	0	1	2	3	4	5	6
12	Have you had a strong desire to lose weight?	0	1	2	3	4	5	6

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**Eating Disorder examination questionnaire (EDE-Q 6.0)**

**Questions 13-18: Please fill in the appropriate number in the boxes on the right. Remember that the questions only refer to the past four weeks (28 days). Over the past four weeks (28 days)...**

13 Over the past 28 days, how many **large amount of food** (given the circumstances)? **times** have you eaten what other people would regard as an **unusually**

14 ... On how many of these times did you have a sense of having lost control over your eating (at the time you were eating)?

15 Over the past 28 days, on how many an unusually large amount of food **and DAYS** have had a sense of loss of control at the time)? have such episodes of overeating occurred (i.e. you have eaten

16 Over the past 28 days, how many shape or weight? **times** have you made yourself sick (vomit) as a means of controlling your

17 Over the past 28 days, how many weight? **times** have you taken laxatives as a means of controlling your shape or

18 Over the past 28 days, how many controlling your weight, shape or amount of fat, or to burn off calories? **times** have you exercised in a "driven" or "compulsive" way as a means of

**Questions 19 to 21: Please circle the appropriate number. Please note that for these questions the term "binge eating" means eating what others would regard as an unusually large amount of food for the circumstances, accompanied by a sense of having lost control over eating.**

		NO DAYS	1-5 DAYS	6-12 DAYS	13-15 DAYS	16-22 DAYS	23-27 DAYS	EVERY DAY
19	Over the past 28 days, on how many days have you eaten in secret (ie, furtively)? ... Do not count episodes of binge eating.	0	1	2	3	4	5	6
		NONE OF THE TIMES	A FEW OF THE TIMES	LESS THAN HALF	HALF OF THE TIMES	MORE THAN HALF	MOST OF THE TIME	EVERY TIME
20	On what proportion of the times that you have eaten have you felt guilty (felt that you've done wrong) because of its effect on your shape or weight? ... Do not count episodes of binge eating.	0	1	2	3	4	5	6
			NOT AT ALL	SLIGHTLY	MODERATELY		MARKEDLY	
21	Over the past 28 days, how concerned have you been about other people seeing you eat? ... Do not count episodes of binge eating.	0	1	2	3	4	5	6

**PAGE 2/3 PLEASE GO TO THE NEXT PAGE**

EDE-Q 6.0  
Sarah Beglin

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**Eating Disorder examination questionnaire (EDE-Q 6.0)**

**Questions 22 to 28: Please circle the appropriate number on the right. Remember that the questions only refer to the past four weeks (28 days).**

ON HOW MANY OVER THE PAST 28 DAYS ...		NOT AT ALL MARKEDLY		SLIGHTLY		MODERATELY		
22	Has your <b>weight</b> influenced how you think about (judge) yourself as a person?	0	1	2	3	4	5	6
23	Has your <b>shape</b> influenced how you think about (judge) yourself as a person?	0	1	2	3	4	5	6
24	How much would it have upset you if you had been asked to weigh yourself once a week (no more, or less, often) for the next four weeks?	0	1	2	3	4	5	6
25	How dissatisfied have you been with your <b>weight</b> ?	0	1	2	3	4	5	6
26	How dissatisfied have you been with your <b>shape</b> ?	0	1	2	3	4	5	6
27	How uncomfortable have you felt seeing your body (for example, seeing your shape in the mirror, in a shop window reflection, while undressing or taking a bath or shower)?	0	1	2	3	4	5	6
28	How uncomfortable have you felt about <b>others</b> seeing your shape or figure (for example, in communal changing rooms, when swimming, or wearing tight clothes)?	0	1	2	3	4	5	6

What is your weight at present? (Please give your best estimate.): .....

What is your height? (Please give your best estimate.): .....

If female: Over the past three to four months have you missed any menstrual periods?: YES  NO

If so, how many?:

Have you been taking the "pill"?: YES  NO

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THANK YOU

**Appendix I: Perfectionism, Persistence and Perseveration Questionnaire (PPPQ-22)**

PPPQ-22

This questionnaire contains a number of statements about how people might behave or think. Please read each item carefully and place a tick in the box which most applies to you.

	Not at all true of me	A little true of me	Somewhat true of me	Very true of me	Totally true of me
1. I hate making mistakes					
2. I keep trying to sort out problems in a relationship, even if I know it's not going to survive.					
3. If a friendship seems to be running into difficulties, I will keep trying to resolve things, in case it's just a hiccup.					
4. If I have an appointment, I always check my travel arrangements carefully in advance to make sure that I have plenty of time to get there and not be late.					
5. When reading a book or magazine, I often feel that I must begin at the first page and read through to the very end, even if some of the parts are of no interest.					
6. When reading a book or magazine, I keep going until I have read all the necessary material, even when the concepts are difficult to understand.					
7. I tend to keep going with a long task until it is complete, rather than giving up quickly.					
8. When I phone someone to get a decision, if I get an engaged tone then I tend to keep ringing back every minute or so, even when the deadline for the decision has passed.					
9. If I have an important test coming up, I am likely to plan carefully which topics I will need to cover, making a revision timetable to ensure I get everything done.					
10. One of my goals is to be perfect in everything I do.					
11. When studying for an important test, I tend to stay up working late into the night, even though I know I am no longer taking in the material and that the studying will not help my performance.					
12. People describe me as someone who can stick at a task, even when it gets difficult.					

13. When calling a tradesman to arrange for him to come to my home, I may continually ring and leave messages on the same number, even though I know that they are not being picked up or responded to.					
14. If I try to solve a problem or puzzle, I do not stop until I find an answer.					
15. Once I have decided to do something, I keep going until I reach my goal.					
16. When calling a tradesman to arrange for him to come to my home, I try all the contact numbers I have for him in the hope of catching him.					
17. Even when I do something very carefully, I often feel that it is not quite right.					
18. When calling a tradesman to arrange for him to come to my home, I would make sure I had all the relevant paperwork and measurements ready.					
19. If I have a problem in my relationship, I will work hard at sorting it out, even if this takes a long time.					
20. When shopping in the supermarket, I walk down the aisles one-by-one until I have covered the whole store, even if I only need a couple of items.					
21. If I am trying to get to an appointment but my car has broken down, I do my best to get there in time by investigating other routes (e.g., finding out if I can get a bus, train or taxi).					
22. Sometimes I find myself continuing to do something even when there is no point in carrying on.					

Thank you very much for completing this questionnaire.

Please check that you have answered each question and that you have put the date at the top of the questionnaire

**Appendix J: Positive and Negative Affect Scale (PANAS)**

## Therapist's Guide to Positive Psychological Interventions

**Worksheet 3.1 The Positive and Negative Affect Schedule (PANAS; Watson et al., 1988)****PANAS Questionnaire**

This scale consists of a number of words that describe different feelings and emotions. Read each item and then list the number from the scale below next to each word. **Indicate to what extent you feel this way right now, that is, at the present moment OR indicate the extent you have felt this way over the past week (circle the instructions you followed when taking this measure)**

1	2	3	4	5
Very Slightly or Not at All	A Little	Moderately	Quite a Bit	Extremely
_____ 1. Interested			_____ 11. Irritable	
_____ 2. Distressed			_____ 12. Alert	
_____ 3. Excited			_____ 13. Ashamed	
_____ 4. Upset			_____ 14. Inspired	
_____ 5. Strong			_____ 15. Nervous	
_____ 6. Guilty			_____ 16. Determined	
_____ 7. Scared			_____ 17. Attentive	
_____ 8. Hostile			_____ 18. Jittery	
_____ 9. Enthusiastic			_____ 19. Active	
_____ 10. Proud			_____ 20. Afraid	

**Scoring Instructions:**

**Positive Affect Score:** Add the scores on items 1, 3, 5, 9, 10, 12, 14, 16, 17, and 19. Scores can range from 10 – 50, with higher scores representing higher levels of positive affect. Mean Scores: Momentary 29.7 (SD 7.9); Weekly 33.3 (SD 7.2)

**Negative Affect Score:** Add the scores on items 2, 4, 6, 7, 8, 11, 13, 15, 18, and 20. Scores can range from 10 – 50, with lower scores representing lower levels of negative affect. Mean Score: Momentary 14.8 (SD 5.4); Weekly 17.4 (SD 6.2)

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## **Appendix K: Attentional Function Index (AFI)**

<p>1. Getting started on activities (tasks, jobs) you intend to do.</p> <p>Not at all _____ Extremely well</p>
<p>2. Following through on your plans.</p> <p>Not at all _____ Extremely well</p>
<p>3. Doing things that take time and effort.</p> <p>Not at all _____ Extremely well</p>
<p>4. Making your mind up about things.</p> <p>Not at all _____ Extremely well</p>
<p>5. Keeping your mind on what you are doing.</p> <p>Not at all _____ Extremely well</p>
<p>6. Remembering to do all the things you started out to do.</p> <p>Not at all _____ Extremely well</p>
<p>7. Keeping your mind on what others are saying.</p> <p>Not at all _____ Extremely well</p>
<p>8. Keeping yourself from saying or doing things you did not want to say or do.</p> <p>Not at all _____ Extremely well</p>
<p>9. Being patient with others.</p> <p>Not at all _____ Extremely well</p>

I. At this time, how would you rate yourself on:

<p>10. How hard you find it to concentrate on details.</p> <p>Not at all _____ A great deal</p>
---

11. How often you make mistakes on what you are doing. Not at all _____ A great deal
12. Forgetting to do important things. Not at all _____ A great deal
13. Getting easily annoyed or irritated. Not at all _____ A great deal

Note : Lines are not printed to 100 mm scale.

**Appendix L: Semi-structured interview schedule**

## Semi-structured interview schedule

### **Preconceptions/assumptions:**

Have you ever fasted before?

Why did you volunteer to do the fast?

Before you fasted what did you think it would be like?

### **Food intake:**

Did you complete the full 20 hours?

If you hadn't have been fasting what would you have normally eaten during that day?

What was your last meal before you fasted?

Prompt - *different to normal? Portion size?*

What did you break your fast on?

Prompt - *different to normal? Portion size? Did you finish it?*

### **Daily activities:**

Can you talk me through the day's activities?

Did you make any changes to your normal day?

### **General experience of fast:**

How would you describe your general experience of fasting?

Prompts: *How was it compared with how you thought it would be? compared with other fasts; easy/difficult experience; hardest/easiest thing about it; particular activities; hardest time of day*

Did you nearly stop fasting at any point?

What allowed you to keep going?

### **Emotional experience:**

Ask at various time points - what emotions were you aware of at this time?

Prompts: *Did mood alter throughout day? unexpected emotions; role of positive emotions; length of time emotions lasted*

**Perception of cognitive ability:**

Were you aware of any changes to your cognitive abilities?

Prompts: *ability to remember information/memory; productivity; taking in new information; focus; distraction; able to think about more than one thing at once; decision making*

How much/often were you thinking about food?

Did you think about your body image/losing weight at all?

**Final questions:**

How would you sum up your overall experience of fasting?

If you were to do it again would you do anything differently?

Is there anything we haven't covered that you would like to mention?

## **Appendix M: Initial codes with examples**

### Initial codes with examples

Initial code	Code description	Examples from interview data
Focus harder on other things	Participants described concentrating or focusing on things other than food to take their mind off the fast	<p>170309 (p7) I was just aware of it all the time. And when I was involved in the work it was almost like right lets get involved in the work because then the time will go quicker and I won't have to be thinking about the time going down until I can have these minstrels which are right in front of me.</p> <p>170314 (p6) I just like switch back to like, ok I'm just going to concentrate on the lecture. Yeah and if there are other distractions like my friends talk to me then I would like not think about it.</p> <p>170303 (p10) I think what shifted my mood was being able to have a conversation with someone for thirty minutes and actually not think about food.</p> <p>170309 (p20) - yeah, I didn't think about it [food] because I was really focussed on what I was doing. So literally, I missed one of the texts by 20 minutes.</p> <p>170305 (p6) I think when I came to the uni and I started to study so I was more focussed, more concentrated so I didn't think about it much, you know, ok I'm fasting...no. So yeah.</p>
Heightened emotions	Participants described feeling more sensitive to things than normal and being more aware of their emotions (positive or negative)	<p>170311 (p11) yeah, I was definitely more aware of everything and because of that I just think that my emotions were slightly heightened. So, when I was laughing it was more of a hysterical laugh and when I was, I was...someone said...oooh I've got a cold....instead of just being like oh what a drama queen I particularly thinking Oh my god, what a pain, don't be so annoying.</p> <p>170307 (p11) Er..yeah...in that, the things that like annoy it would be heightened I suppose, like your reactions to stuff are greater</p> <p>170315 (p8) I suppose I got a little upset about little things, more than I would do normally or things like after the phone call started bothering you like what did he mean by that?</p> <p>170304 (p12) I noticed things more like what people were doing more. Not necessarily everyone but like small things like, say if someone was breathing really loudly next to me I would just like notice that a lot. Or just like eating next to me and I'd find that like, I'd find little things like I'd notice</p>

		a lot more. Or I'd become like quite agitated by them.
Excitement	Participants described a sense of excitement towards the end of the fast	<p>170308 (p10) Yeah, around 5 as well, 5 I was quite positive around 5 as well because I'd just woke up and then I kind of stayed still, low for like an hour and by the end I was quite excited....Hmmm, I didn't think I'd get that happy over food.</p> <p>170312 (p10) Because I think I knew the end was coming and I was starting to get excited about eating and I was thinking about what I would eat and like planning it. So like I think I actually think I felt better then than like during the middle because I knew that it was so close to the end and I was nearly finished.</p> <p>170314 (p10) Yeah, like I felt a lot more excited. Erm, more...like yeah, like mood lifted when you know, like finally going to have the meal.</p> <p>170304 (p10) I was quite excited about it finishing so like I guess the kind of, yeah that would have helped me not...eaten at the end. It gave me a lot er, you know to think about so that I think yeah, I think that was definitely I was looking forward to that a lot, I got really excited.</p>

## **Appendix N: List of codes**

## List of Codes

Temptation  
Denying self  
Food cues  
Structure to day  
Heightened emotions  
Sense of achievement  
Food as elicit  
Positive/negative/positive experience  
Focus on other things  
Low energy  
Low mood  
Distraction  
Productivity  
Hyper  
Not hungry and of fast  
Contract  
Personal decision  
Intrusive thoughts  
Gave up quicker on other things  
Determination  
Mood dropped after eating  
Sense of achievement  
Could have fasted longer  
Anticipation at end  
Aware of calories  
Food anti-climax

Having to think in a different way

Social impact

Avoiding food

Self-induced

Focus

Attention to detail

Eating as routine

Irritability

Reduced cognitive function

Guilt

Senses

Counting down to deadline

Excitement

Food cues

Empowering

Concentration

Stick to plans

Can only focus on not eating

Day not broken up by food

Stress/anxiety

## **Appendix O: Map of initial themes**

