Psychological Factors & Obesity: Antecedents or Consequences?

Food, Health, Choice & Change
Dublin, June 6-7\textsuperscript{th} 2012

Barbara Stewart-Knox
b.knox@ulster.ac.uk
Growing evidence for a relationship between psychological well-being and obesity
Research has focussed on depression and/or stress
Lack of research into obesity and positive, potentially protective, psychological factors

Resilience – ability to bounce back
Mood – a central stable trait related to sociability

Resilience and mood likely to interact with life experiences

Stewart-Knox, BPS Bull., 2005
### Studies of obesity and stress/depression (2010-2007)

<table>
<thead>
<tr>
<th>Sample</th>
<th>WC</th>
<th>BMI</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bove et al. 2010</td>
<td>null</td>
<td>Lower stress</td>
<td>PSQ</td>
</tr>
<tr>
<td>N=106 79+yrs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Van Jaarsveld et al. 2009</td>
<td>Higher stress</td>
<td>Higher stress</td>
<td>PSS</td>
</tr>
<tr>
<td>N=4065</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farag et al. 2008</td>
<td>-</td>
<td>Higher stress</td>
<td>PSS</td>
</tr>
<tr>
<td>N=78/24-72 yrs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lahari et al. 2007</td>
<td>null</td>
<td>null</td>
<td>null</td>
</tr>
<tr>
<td>N=414</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample</td>
<td>WC</td>
<td>BMI</td>
<td>Measure</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------------------</td>
<td>-------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Zaninotto et al. 2010</td>
<td>Higher depression</td>
<td>Lower depression</td>
<td></td>
</tr>
<tr>
<td>Bove et al. 2010</td>
<td>null</td>
<td>null</td>
<td>SRDS</td>
</tr>
<tr>
<td>Kim et al. 2010</td>
<td>null</td>
<td>Lower depression</td>
<td>GDS</td>
</tr>
<tr>
<td>Rice et al. 2010</td>
<td>Higher depression</td>
<td>Higher depression</td>
<td>BDI</td>
</tr>
<tr>
<td>Vogelzangs et al. 2010</td>
<td>Higher depression</td>
<td>null</td>
<td>CESDS</td>
</tr>
<tr>
<td>Papelbaum et al. 2010</td>
<td>null</td>
<td>null</td>
<td>BDI</td>
</tr>
<tr>
<td>Ucok et al. 2009</td>
<td>null</td>
<td>null</td>
<td>BDI</td>
</tr>
<tr>
<td>Beydoun et al. 2009</td>
<td>Higher depression</td>
<td>-</td>
<td>CESD</td>
</tr>
<tr>
<td>Muhtz et al. 2009</td>
<td>Higher depression</td>
<td>-</td>
<td>PHQ</td>
</tr>
<tr>
<td>Dunbar et al. 2008</td>
<td>Higher depression</td>
<td>null</td>
<td>HADS</td>
</tr>
<tr>
<td>Vogelzangs et al. 2008</td>
<td>Higher depression</td>
<td>null</td>
<td>CESDS</td>
</tr>
<tr>
<td>Ho et al. 2008</td>
<td>Lower depression</td>
<td>GDS</td>
<td></td>
</tr>
<tr>
<td>Moreira et al. 2007</td>
<td>Higher depression</td>
<td>Higher depression</td>
<td>BDI</td>
</tr>
</tbody>
</table>
AIM:

- Determine the relative contribution of cultural, demographic, lifestyle, social and psychological factors to the **prevention or development** of obesity and the metabolic syndrome
  - Explore interrelationships between co-factors
  - Identify targets for intervention
  - Consider health promotion requirements
‘We didn’t actually have a psychologist available at all … but it would have been brilliant if we had’ (GB; Dietitian)

‘Certainly there is a huge demand for psychology services in primary care and I think a lot of the prescribing budgets could be reduced if there was access to reasonably prompt support from the psychologist’ (GB; GP)

‘… suffering with her nerves, sitting at home … no longer a size 8 … over the death of her dad’ (GB; Consumer; F; 42-49)
Survey (N=1500+)
GB (n=1000)/Portugal (n=500)

- **Demographic details**
- **Lifestyle**
  - Diet (FFQ)
  - Physical activity
- **History of Met Syn:**
  - Blood Pressure
  - High Cholesterol
  - High/Low Blood Sugar

**Validated Scales:**
- Resilience Scale (RS11) (Wagnild & Young, 1993)
- Mood Survey (Underwood & Froming, 1980)
- Hopelessness Scale – (Beck et al., 1974)
- Perceived Stress Scale (PSS4) (Cohen et al., 1983)
- Life Events Scale (LES) (Mooy et al., 2000)

**Anthropometric measures**
- BMI
- Waist circ (WC)

Duffy M et al. (in press) *BMS Public Health.*
## Anthropometric Measures

<table>
<thead>
<tr>
<th></th>
<th>BMI (kg/m²)</th>
<th>Waist Circumference (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mood Valance</td>
<td>-.05*</td>
<td>-.02</td>
</tr>
<tr>
<td>Mood Variability</td>
<td>.06**</td>
<td>.09**</td>
</tr>
<tr>
<td>Mood Intensity</td>
<td>.07**</td>
<td>.05*</td>
</tr>
<tr>
<td>Hopelessness</td>
<td>-.01</td>
<td>.00</td>
</tr>
<tr>
<td>Resilience</td>
<td>-.19**</td>
<td>-.05*</td>
</tr>
<tr>
<td>Perceived Stress</td>
<td>.04</td>
<td>.01</td>
</tr>
</tbody>
</table>

\* Pearson’s Bivariate Correlation

\** P<0.001

\* P<0.05

---


Duffy M et al. (in press) *BMS Public Health.*
Association between Mood Variability and Waist Circumference (cm) for Total Sample (N=1722)

\[ R^2 = 0.40 \]
Association between Mood Variability and BMI for Total Sample (N=1722)

\[ R^2 = 0.55 \]

Mood Variability & BMI:
Association between Mood Intensity and WC (cm) for Total Sample (N=1722)

$R^2 = 0.59$
Association between Mood Intensity and BMI for Total Sample (N=1722)

\[ R^2 = 0.34 \]
Resilience (RS11) & Waist Circumference

(N=1000)

R^2 Linear = 0.038
Multinomial Logistic Regression Analysis (N-1500+)

Anthropometric measures – body fat distribution (BMI) and waist circumference (WC)

**Predictor variables:**
- Demographic information – sex; age; sex/age; working/not working; and, education level (primary/secondary/tertiary)
- Physical/sedentary activity - week days/weekend
- Dietary habits - Food Frequency Questionnaire (FFQ) - 3 factors: ‘alcohol’; ‘healthy’; and, ‘unhealthy’
- Resilience Scale (RS11)
- Mood Survey
- Hopelessness Scale (BDI)
- Perceived Stress Scale (PSS4)- 2 factors: ‘emotional’ and ‘control’
- Life Events Scale (LES) 5 Factors: ‘relationships’; financial’; ‘illness’; ‘bereavement’; and, ‘employment’

Duffy M et al. (in press) *BMS Public Health.*
<table>
<thead>
<tr>
<th></th>
<th>Body Mass Index</th>
<th></th>
<th>Waist Circumference</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GB β</td>
<td>Portugal β</td>
<td>GB β</td>
<td>Portugal β</td>
</tr>
<tr>
<td>Sex</td>
<td>-0.38</td>
<td>-0.90</td>
<td>0.36**</td>
<td>0.17*</td>
</tr>
<tr>
<td>Working Stat</td>
<td>-0.06</td>
<td>-0.12</td>
<td>0.05</td>
<td>-0.02</td>
</tr>
<tr>
<td>Age (Yrs)</td>
<td>-0.02</td>
<td>-0.224**</td>
<td>-0.05</td>
<td>-0.04</td>
</tr>
<tr>
<td>Ed (Yrs)</td>
<td>-0.10†</td>
<td>-0.083</td>
<td>-0.11**</td>
<td>-0.14**</td>
</tr>
<tr>
<td>Age/Sex</td>
<td>-0.06</td>
<td>0.173</td>
<td>0.13**</td>
<td>0.19*</td>
</tr>
<tr>
<td>Relationships</td>
<td>-0.03</td>
<td>-0.030</td>
<td>-0.02</td>
<td>-0.08</td>
</tr>
<tr>
<td>Financial</td>
<td>-0.05</td>
<td>0.053</td>
<td>0.01</td>
<td>0.07</td>
</tr>
<tr>
<td>Illness</td>
<td>0.13**</td>
<td>0.106†</td>
<td>0.14**</td>
<td>0.05</td>
</tr>
<tr>
<td>Bereavement</td>
<td>0.01</td>
<td>-0.052</td>
<td>0.01</td>
<td>0.03</td>
</tr>
<tr>
<td>Employment</td>
<td>0.04</td>
<td>-0.053</td>
<td>0.02</td>
<td>-0.05</td>
</tr>
<tr>
<td>Sedentary act</td>
<td>0.13**</td>
<td>-0.092</td>
<td>0.13**</td>
<td>0.08</td>
</tr>
<tr>
<td>Physical act</td>
<td>-0.01</td>
<td>-0.117†</td>
<td>0.02</td>
<td>-0.12†</td>
</tr>
</tbody>
</table>

Duffy M et al. (in press) *BMS Public Health.*
<table>
<thead>
<tr>
<th></th>
<th>Body Mass Index</th>
<th>Waist Circumference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GB β</td>
<td>Portugal β</td>
</tr>
<tr>
<td>FFQ ‘alcohol’</td>
<td>0.07†</td>
<td>0.061</td>
</tr>
<tr>
<td>FFQ ‘unhealthy’</td>
<td>0.02</td>
<td>-0.013</td>
</tr>
<tr>
<td>FFQ ‘healthy’</td>
<td>-0.06†</td>
<td>-0.033</td>
</tr>
<tr>
<td>Mood Valance</td>
<td>0.083</td>
<td>-0.070</td>
</tr>
<tr>
<td>Mood Intensity</td>
<td>0.052</td>
<td>0.013</td>
</tr>
<tr>
<td>Mood Variability</td>
<td>-0.008</td>
<td>-0.012</td>
</tr>
<tr>
<td>Hopelessness</td>
<td>0.01</td>
<td>0.015</td>
</tr>
<tr>
<td>Resilience</td>
<td>-0.05</td>
<td>0.254**</td>
</tr>
<tr>
<td>Stress emotion</td>
<td>-0.03</td>
<td>0.241†</td>
</tr>
<tr>
<td>Stress control</td>
<td>-0.05</td>
<td>0.04</td>
</tr>
</tbody>
</table>

*P<0.05, **P<0.01, †10% significant

FFQ=Food Frequency Questionnaire

Duffy M et al. (in press) *BMS Public Health.*
<table>
<thead>
<tr>
<th>GB</th>
<th>Portugal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BMI</strong></td>
<td><strong>BMI</strong></td>
</tr>
<tr>
<td>▪ Less education</td>
<td>▪ Being older</td>
</tr>
<tr>
<td>▪ Illness in family</td>
<td>▪ Lower resilience</td>
</tr>
<tr>
<td>▪ Alcohol</td>
<td></td>
</tr>
<tr>
<td>▪ Sedentary behaviour</td>
<td></td>
</tr>
<tr>
<td>Total = 5%</td>
<td>Total = 1%</td>
</tr>
<tr>
<td><strong>WC</strong></td>
<td><strong>WC</strong></td>
</tr>
<tr>
<td>▪ Being male</td>
<td>▪ Being male</td>
</tr>
<tr>
<td>▪ Less education</td>
<td>▪ Less education</td>
</tr>
<tr>
<td>▪ Illness in family</td>
<td></td>
</tr>
<tr>
<td>▪ Sedentary behaviour</td>
<td></td>
</tr>
<tr>
<td>▪ Lower resilience</td>
<td></td>
</tr>
<tr>
<td>Total = 23%</td>
<td>Total = 7%</td>
</tr>
</tbody>
</table>
- Less education
- Illness in family
- Alcohol
- Sedentary behaviour

Total = 5%

BMI

- Being older
- Lower resilience

Total = 5%

Portugal

- Being male
- Less education
- Illness in family
- Sedentary behaviour
- Lower resilience

Total = 23%
What are the possible mechanism/s though which psychological factors trigger/exacerbate obesity?
They’re showing my arse on the news to illustrate a story about obesity! I CAN NOT BELIEVE THIS IS ACTUALLY HAPPENING!

Well, you are obese, love...

I’m not! I’m just very hungry! It’s an illness, woman!

Oh God...

I wondered what that camera crew were doing looking all shifty outside Argos yesterday...

Well - now I know!

I... I hate myself, Riba... There there, love

Have another lollipop cheers
Nutrient/brain interactions?

- Neurotransmitters are synthesised de novo using precursors in food:
  - **Phenethylamines** - dopamine, epinephrine, norepinephrine, tyramine, octopamine
  - **Indolamines** - serotonin, melatonin, tryptamine
  - **Cholinergics** - acetylcholine, choline
  - **Amino acids** - glutamate, aspartate, glycine, taurine, histamine, gamma-amino butyric acid (GABA)
The ‘Wurtman’ hypothesis?

- Carbohydrates enhance mood through the release of tryptophan (a precursor of serotonin) \( (\text{Wurtman} \& \text{Wurtman}, 1995) \)

  Stress-prone individuals ‘self-medicate’ with high calorie carbohydrates \( (\text{Corsica} \& \text{Spring}, 2008; \text{Markus}, 2002; \text{Oliver et al.}, 2000; \text{Macht}, 1999; \text{Steptoe et al.}, 1998) \)

  Obese individuals tend to binge eat when in negative mood \( (\text{Chua et al.}, 2004) \)

  Positive mood associated with ‘healthy’ eating and negative mood with ‘unhealthy’ eating \( (\text{Garg et al.}, 2007; \text{Williams et al.}, 2004) \)
Leptin – a hormone released by adipose tissue

Higher levels observed in obese
May mediate glucose and fat metabolism *(Nonogaki, 2000)*

Signals to neuro-chemicals in the central nervous system (CNS) *(Halford, 2001)*

May stimulate SNS activity *(Esler et al., 2001)*

The Leptin hypothesis?
Sympathetic nervous system (SNS), inflammatory and immune system share foetal origins

Chronic stress associated with abdominal obesity (Steptoe & Marmot, 2003; Bjorntrop & Rosmond, 2000)

Salivary cortisol and abdominal obesity correlated (Ward et al., 2004; Rosmond et al., 2000)
The serotonin (5-HT) hypothesis?

- Abdominal obesity associated with:
  - High 5HT activity *(Eikelis et al., 2004)*
  - Schizophrenia *(Basu et al., 2004)* and clinical depression *(McElroy, 2004)*
  - Prolonged use of anti-psychotic drugs *(Vieta, 2004)*
- Serotonin agonists increase plasma leptin and cortisol response in obese women *(Oppert et al., 1997)*
Possible Pathways to Obesity?

Central Nervous System (CNS)
Limbic System

Sympathetic Nervous System (SNS)

Fight & Flight Response

Immune System
Acute Phase Response (APR)

Cytokines

Serotonin (5HT)
Leptin/Grelin
Visceral Fat

Insulin Resistance
Possible Pathways to Obesity?

Central Nervous System (CNS) Limbic System

Sympathetic Nervous System (SNS)

Immune System
Acute Phase Response (APR)

Cytokines

Fight & Flight Response

Insulin Resistance

Serotonin (5HT)
Leptin/Grehlin
Visceral Fat
Method

- **Sample** (N=68)
  Healthy male (n=23) and female (n=45) volunteers aged 20-66 years

- **Measures**
  Whole blood serotonin
  Anthropometry

**Anthropometric assessment**
- Body Mass Index (BMI)
- Waist circum (WC)

**Dual Energy X-Ray Absorptiometry (DEXA)**
- Total body fat
- Lean tissue
- Android fat
- Gynoid fat

Hodge S et al. (in press) *Obesity Facts.*
Whole blood serotonin (5-HT) and body weight (N=61)

\(X^2 = -.262; \ P = 0.040\)

Hodge S et al. (in press) Obesity Facts.
Whole blood serotonin (5-HT) and waist circumference (N=61)

\[ (X^2 = -.334; \, P = 0.008) \]

Hodge S et al. (in press) *Obesity Facts.*
DEXA Scanning

Hodge S et al. (in press) *Obesity Facts.*
Hodge S et al. (in press) *Obesity Facts.*
Whole blood serotonin (5-HT) and body mass (N=62)

\(X^2=-.288; P=0.022\)

Hodge S et al. (in press) *Obesity Facts.*
Whole blood serotonin (5-HT) and % body fat (N=62) 

\( \chi^2 = -.359; \quad P = 0.004 \)

Hodge S et al. (in press) *Obesity Facts.*
Whole blood serotonin (5-HT) and % android fat (N=62)

\[(X^2=0.356; P=0.004)\]

Hodge S et al. (in press) *Obesity Facts.*
Obesity Police
Fighting Obesity

Introducing the Community Support Officers

What shall we do today?

Let's go out and fight obesity

Great idea!

You know—fighting obesity is about so much more than shooting fat people

belltoons.co.uk
Conclusion

• Positive, protective psychological factors more important than negative factors (eg. stress and depression) in determining obesity
• Psychological intervention required to prevent and treat obesity effectively
• Target -
  • Males
  • Older people
  • Carers
• Promote -
  • Physical activity
  • Resilience
THANKS

Professor Mike Gibney
Professor Daniel Almeida
Professor Brendan Bunting
Dr Maresa Duffy
Mrs Heather Parr
Dr Silvia Pinhao
Ms Stephanie Hodge

FCNAUP

Ipsos MORI


