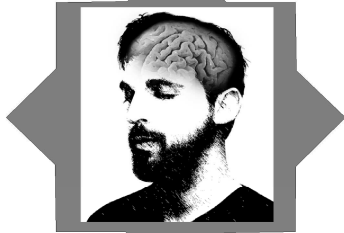


## Brain & physiological needs



**Dr James Neill**

Centre for Applied Psychology  
University of Canberra  
2011

Image source

1

## Learning outcomes

1. Drives and instincts
2. **Theories of motivation**, consciousness and volitional behaviour,
3. Self-control and self-regulation
4. Structure and function of emotions
5. Relationships between emotion and cognition
6. Regulation of emotions

4

## Overview



1. Recap
2. Motivated & emotional brain
3. Physiological needs



2

## What is motivation?

- **Processes** that give behaviour **energy and direction** (Reeve, 2009).
- **Needs or desires** that **energise and direct** behaviour (Gerrig et al., 2008).

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## Recap: Introduction & History of Motivation & Emotion

(Lecture 01 - Ch 1 & 2, Reeve,  
2009)

3

## Two perennial questions

- What causes behaviour?
- Why does behaviour vary in its intensity?

Based on Reeve (2009)

6

## Four motivational sources

- Needs
- Cognitions
- Emotions
- External events

## Four ways to measure motivation

- Behaviour
- Engagement
- Brain & physiological activations
- Self-report

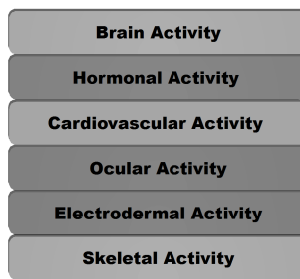
7

## The motivated & emotional brain

Reading:  
Reeve (2009), Ch 3

10

## Brain & physiological activity as expressions of motivation



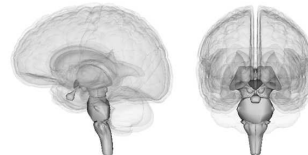
Based on Reeve (2009, Table 1.3, p. 13)

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## Example: Hunger

### Ghrelin

Hormone made in stomach after extended period of time with little or no food.



### Hypothalamus

Via bloodstream, ghrelin stimulates the hypothalamus to create experience of hunger

### Leptin

Adipose (fat) tissue creates & releases leptin into the blood to stimulate brain activity underlying satiety (feeling full)

Based on Reeve (2009, pp. 48-49)

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## History of motivation

1. Will
2. Instinct
3. Drive
4. Incentive, arousal, discrepancy
5. Mini-theories
6. Contemporary era
  1. Active nature of the person
  2. Cognitive revolution
  3. Applied socially relevant research

Based on Reeve (2009, Ch 2, pp. 26-46)

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## The motivated & emotional brain

“The brain is not only a thinking brain, it is also the center of motivation and emotion.”

### Brain



### Thinking Brain

Cognitive & Intellectual Functions  
“What task it is doing”

### Motivated Brain

“Whether you want to do it”

### Emotional Brain

“What your mood is while doing it”

Based on Reeve (2009, pp. 49-50)

12

### Three principles in motivational and emotional brain research

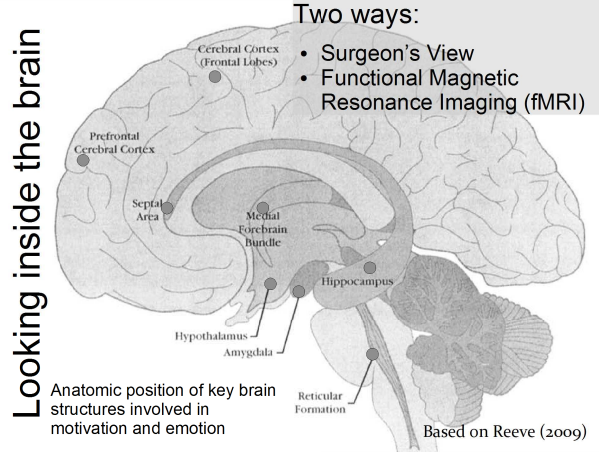
Specific brain structures generate specific motivational states. e.g., hypothalamus → hunger

Biochemical agents stimulate these brain structures. e.g., ghrelin → bloodstream → hypothalamus

Day-to-day events stir biochemical agents into action. e.g., dieting & sleep deprivation → ↑ ghrelin & ↓ leptin

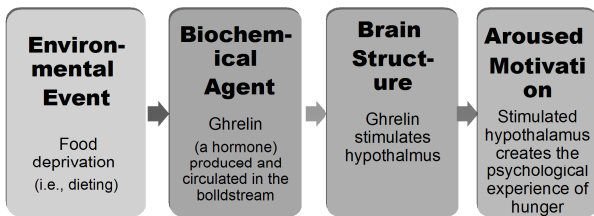
Based on Reeve (2009)

13



### The motivated brain: Food deprivation

“Food deprivation activates the ghrelin release that stimulates the hypothalamus to create hunger.”



Based on Reeve (2009), Figure 3.2, p. 51

14

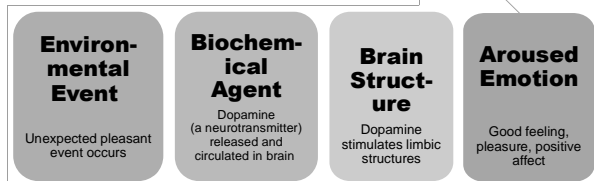
### Motivational & emotional states associated with brain structure: Approach-oriented

Brain structure	Associated motivational or emotional experience
Hypothalamus	Pleasurable feelings associated with feeding, drinking, mating
Medial Forebrain Bundle	Pleasure, reinforcement
Orbitofrontal Cortex	Learning the incentive value of events, making choices
Septate area	Pleasure centre associated with sociability, sexuality
Nucleas Accumbens	Pleasure experience of reward, hotspot for liking
Anterior Cingulate Cortex	Mood, volition, making choices
Cerebral Cortex (Frontal Lobes)	Making plans, setting goals, formulating intentions
Left Prefrontal Cerebral Cortex	Approach motivational and emotional tendencies
Medial Prefrontal Cerebral Cortex	Learning response-outcome contingencies that underlie perceived control beliefs and mastery motivation

Based on Reeve (2009) Table 3.1

### The emotional brain: Positive affect

Good event activates the Dopamine release that stimulates positive affect



Based on Reeve (2009), Figure 3.3, p. 51

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### Motivational & emotional states associated with brain structure: Avoidance-oriented

Brain structure	Associated motivational or emotional experience
Right Prefrontal Cerebral Cortex	Withdraw motivational and emotional tendencies
Amygdala	Detecting and responding to threat and danger (e.g., via fear, anger, and anxiety)
Hippocampus	Detecting and responding to threat and danger (e.g., via fear, anger, and anxiety)

Based on Reeve (2009)

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## Motivational & emotional states associated with brain structure: Arousal

Brain structure  
Reticular formation

Associated motivational or emotional experience  
Arousal

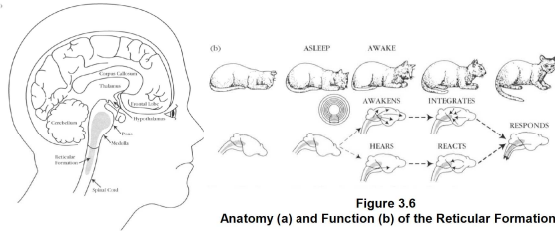


Figure 3.6  
Anatomy (a) and Function (b) of the Reticular Formation

Based on Reeve (2009)

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## Dopamine

**Dopamine release and incentives:** Incentives (stimuli that foreshadow the imminent delivery of rewards) triggers dopamine release.

**Dopamine release and reward:** Dopamine release teaches us which events in the environments are rewarding.

**Dopamine and motivated action:** Dopamine release activates voluntary goal-directed approach responses.

**Addictions:** Addictive drugs are potent reinforcers because their repeated usage produces hypersensitivity to dopamine stimulation.

**Liking and wanting:** For the full experience of reward, wanting and liking need to occur together.

Based on Reeve (2009)

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## Neurotransmitter pathways in the brain

- **Neurotransmitter pathway:**  
A cluster of neurons that communicate with other neurons by using one particular neurotransmitter

- **Four motivationally relevant neurotransmitter pathways**

- Dopamine
- Serotonin
- Norepinephrine
- Endorphin

Based on Reeve (2009)

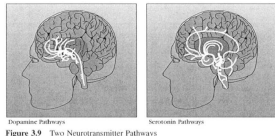


Figure 3.9 Two Neurotransmitter Pathways

Based on Reeve (2009), pp. 63-64

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## Hormones in the body

Essential hormones underlying motivation, emotion, and behaviour

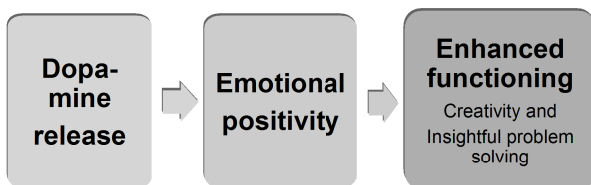
Cortisol	Testosterone	Oxytocin
<ul style="list-style-type: none"> <li>• "Stress hormone"</li> <li>• Associated with poor intellectual functioning, negative affect, and poor health outcomes</li> </ul>	<ul style="list-style-type: none"> <li>• Associated with high sexual motivation</li> <li>• Underlies the mating effort</li> </ul>	<ul style="list-style-type: none"> <li>• Motivates seeking the counsel, support, and nurturance of others during times of stress</li> <li>• Bonding hormone "Tend and befriend stress response"</li> </ul>

Based on Reeve (2009)

23

## Dopamine

"Dopamine release stimulates good feelings."



Based on Reeve (2009), pp. 63-64

21

## The world in which brain lives

Motivation Cannot Be Separated From The Social Context in Which It Is Embedded

- Environmental events act as the natural stimulators of the brain's basic motivational process.

We Are Not Always Consciously Aware of the Motivational Basis of Our Behaviour

- A person is not consciously aware of why he or she committed the social or antisocial act.

Based on Reeve (2009)

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# Physiological needs

Reading:  
Reeve (2009), Ch 4

25

## Maslow's hierarchy of needs

- Abraham Maslow (1970) suggested that human needs can be organised hierarchically.
- **Physiological needs** (e.g., breathing, hunger) come first
- Then **psychological needs** (e.g., self-esteem) are pursued.



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**Need:** any condition within an organism that is essential and necessary for life, growth, and well-being.

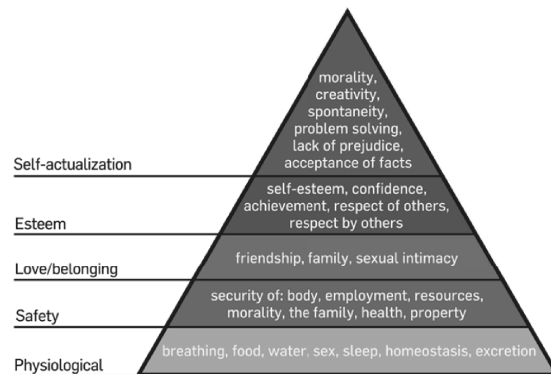
When needs are nurtured and satisfied, well-being is maintained and enhanced.

If neglected or frustrated, the need's thwarting will produce damage that disrupts biological or psychological well being.

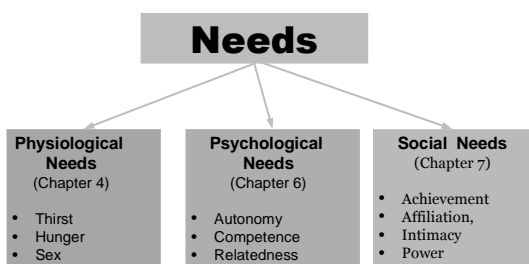
Motivational states therefore provide the impetus to act before damage occurs to psychological and bodily well being.

Based on Reeve (2009) 26

## Maslow's hierarchy of needs



## Need structure: Types of needs



Inherent within the workings of biological systems

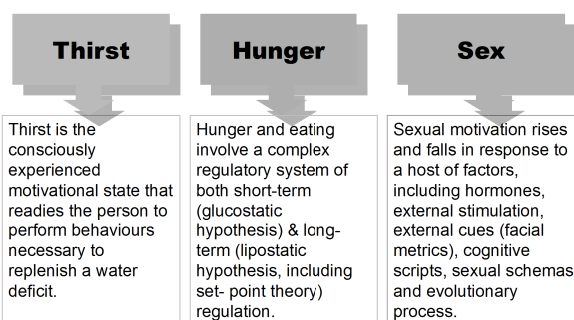
Based on Reeve (2009)

Internalised or learned from our emotional and socialisation histories

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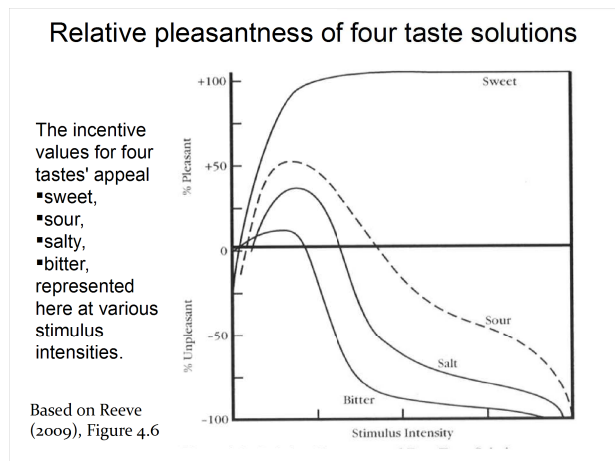
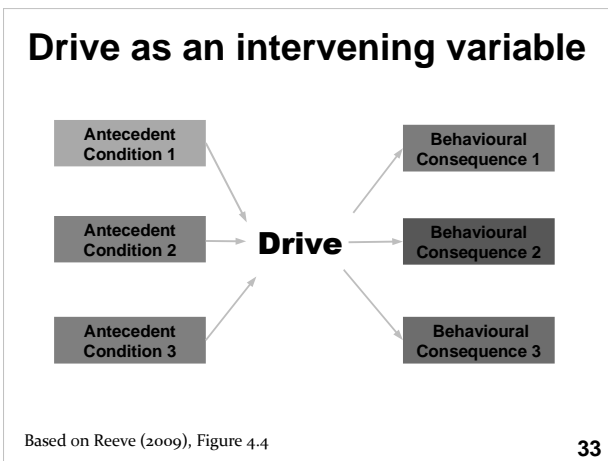
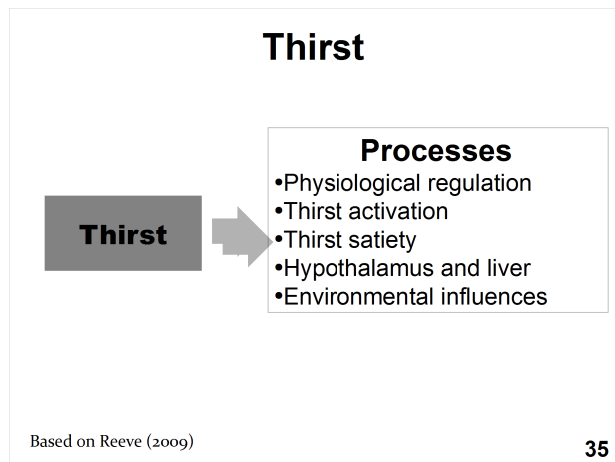
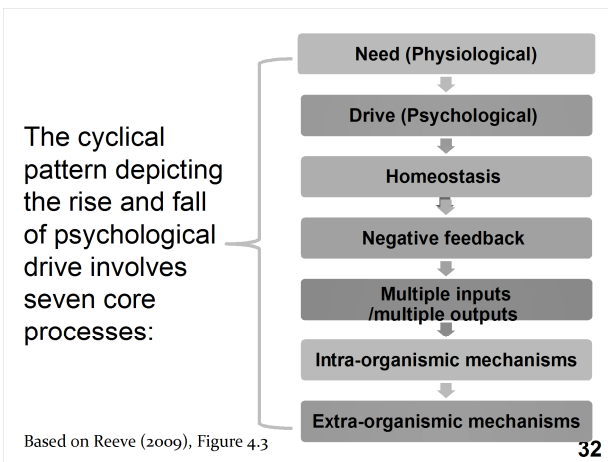
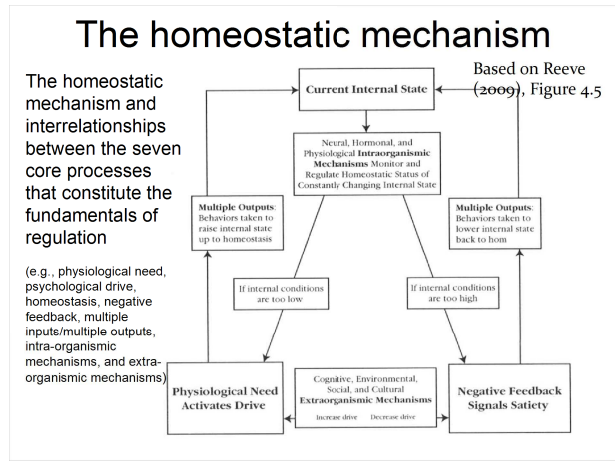
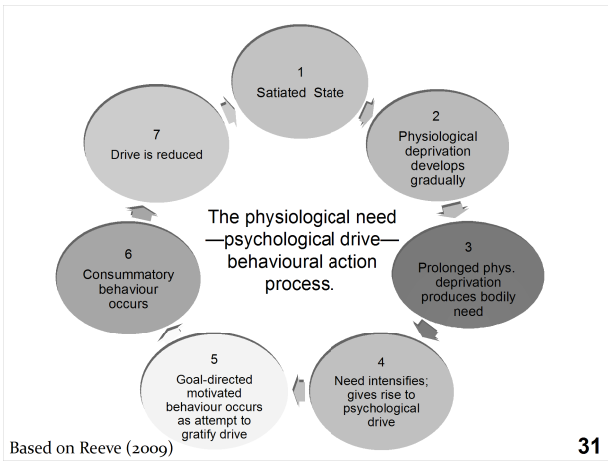
## Physiological needs

Inherent within the workings of biological systems.



Based on Reeve (2009)

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# Hunger

## Processes

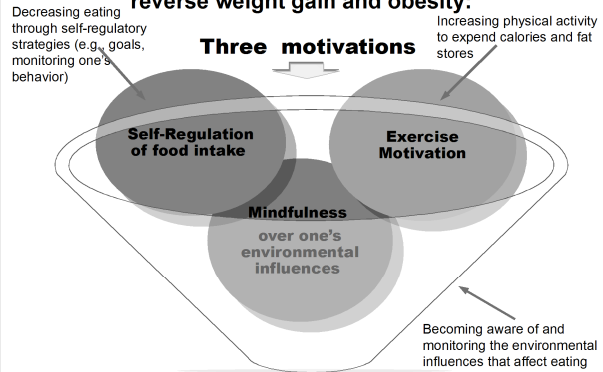
- Physiological regulation
- Short-term appetite
- Long-term energy balance
- Comprehensive model of hunger
- Regulation
- Environmental influences
- Restraint-release situations
- Cognitively-regulated eating style
- Weight gain & obesity
- Set point or settling points?

**Hunger** →

Based on Reeve (2009)

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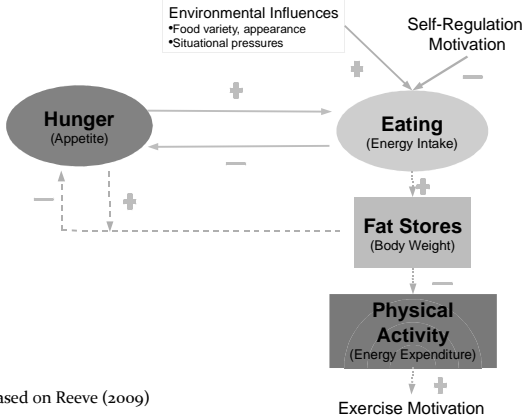
## Other than surgery, three ways people can prevent or reverse weight gain and obesity:



Based on Reeve (2009)

40

## Comprehensive model of hunger regulation



Based on Reeve (2009)

Exercise Motivation

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# Sex

## Processes

- Physiological regulation
- Facial metrics
- Sexual scripts
- Sexual orientation
- Evolutionary basis of sexual motivation

**Sex** →

Based on Reeve (2009)

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## Environmental influences

- Environmental influences that affect eating behaviour the time of day, stress, and the sight, smell, appearance, and taste of food.
- Eating behaviour increases significantly, for instance, when an individual confronts a variety of foods, a variety of nutrients, and a variety of tastes.

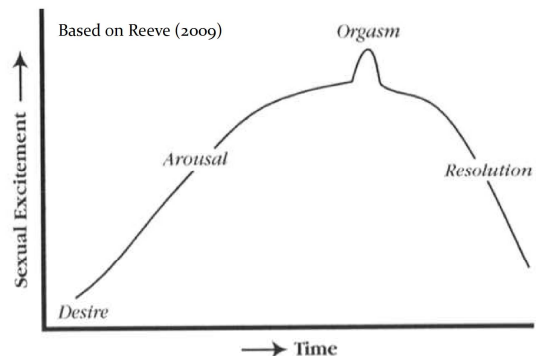
Ice-Cream Intake (in Grams) for Students Alone versus in Group and with One Versus Three Flavors

	Social setting			
	Alone		Three-person group	
	Number of flavors		Number of flavors	
	1	3	1	3
Males	113.8	211.1	245.6	215.6
Females	76.9	137.7	128.5	170.8

Based on Reeve (2009)

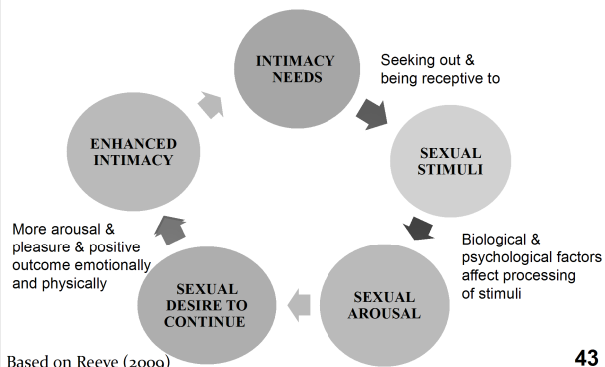
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## Traditional sex response cycle



The triphasic sexual response cycle describes men's sexual motivation.

## Alternative sex response cycle



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## Next lecture

- Psychological and social needs (Ch 6 & Ch 7)

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## Gender differences in mate preferences

Variable	Men	Women	Gender Difference?
Physical Appearance			
Is good-looking	3.59	2.58	Yes, greater preference for men
Age			
Is younger than me by 5 years	4.54	2.80	Yes, greater preference for men
Is older than me by 5 years	4.15	5.29	Yes, greater preference for women
Earning Potential			
Holds a steady job	4.27	5.38	Yes, greater preference for women
Earns more than me	5.19	5.93	Yes, greater preference for women
Has more education than me	5.22	5.82	Yes, greater preference for women
Other Variables			
Has been married before	3.35	3.44	No significant gender difference
Has children	2.84	3.11	Yes, greater preference for women
Is of a different religion than me	4.24	4.31	No significant gender difference
Is of a different race than me	3.08	2.84	Yes, greater preference for men

Note. The possible range for each score was 1 (not at all) to 7 (very willing to marry someone who...).

## References

- Gerrig, R. J., Zimbardo, P. G., Campbell, A. J., Cumming, S. R., & Wilkes, F. J. (2008). *Psychology and life* (Australian edition). Sydney: Pearson Education Australia.
- Reeve, J. (2009). *Understanding motivation and emotion* (5th ed.). Hoboken, NJ: Wiley.

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## Failures to self-regulate physiological needs

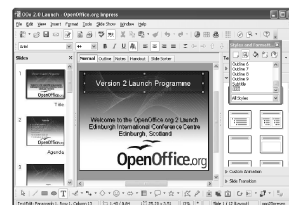
People fail at self-regulation for three primary reasons

- 1 People routinely underestimate how powerful a motivational force biological urges can be when they are not currently experiencing them.
- 2 People can lack standards, or they have inconsistent, conflicting, unrealistic, or inappropriate standards.
- 3 People fail to monitor what they are doing as they become distracted, preoccupied, overwhelmed, or intoxicated.

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