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An independent academic psychologist, based in England, who has written extensively on different areas of psychology with an emphasis on the critical stance towards traditional ideas.

A complete listing of his writings at http://psychologywritings.synthasite.com/ and http://kmbpsychology.jottit.com.

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1. ESTABLISHING THE RISK OF INJURIES IN RUGBY

Rugby is a physical contact sport which can lead to related injuries. The risk of such injuries is contested.

Freitag et al (2015) performed a systematic literature review to establish the level of rugby-related injuries [1] among players under twenty-one years old. Thirty-five relevant studies were included on rugby union and rugby league. The most studies came from Australia (10), and the majority covered rugby union only (26). There were more studies of males only (26).

The overall calculation was that 28% of players would sustain an injury in a season irrespective of the need for medical attention. The most frequent types of injuries were sprains, strains, and soft tissue injuries.

The injury incidence for rugby union was 26.7 per 1000 player-hours as compared to 81 in men's professional rugby union (Williams et al 2013; table 1.1).

- Meta-analysis of fifteen studies of injuries in professional men's rugby union between 1995 and 2012.
- Injury incidence - 81 per 1000 player-hours in matches and 3 in training. International matches = 123 (training = 3), level one club matches [2] = 89 (training = 3); level two club matches [3] = 35.
- Highest risk was during tackling, in third quarter of matches (ie: 40th-60th minutes), and to lower limb (muscle/tendon and joint (non-bone)/ligament most common types).
- The researchers felt that "match injury incidence rates in professional rugby union can be considered high in comparison with other team sports, but similar to other collision sports" (p1051) - eg: 79 per 1000 player-hours in international ice hockey (Lofentzon et al 1988); 68 in semi-professional rugby league (Gabbett 2005; appendix 1A).

Table 1.1 - Details of Williams et al (2013).

[1] The International Rugby Board (IRB) (now known as World Rugby) defined injury as "any physical complaint, which was caused by a transfer of energy that exceeded the body's ability to maintain its structural and/or functional integrity, that was sustained by a player during a rugby match or rugby training, irrespective of the need for medical attention or time-loss from rugby activities. An injury that results in a player receiving medical attention is referred to as a 'medical-attention' injury and an injury that results in a player being unable to take full part in future rugby training or match play as a 'time-loss' injury" (quoted in Freitag et al 2015).

[2] Defined as highest league in top 10 rugby-playing countries (eg: "Super" rugby in southern hemisphere).

[3] Defined as lower leagues in top 10 rugby-playing countries (eg: Championship in England) or highest league in seven tier two nations (eg: Japan).

Kirkwood et al (2015) concentrated on concussion, of which there is a concern over poorer cognitive function (even three months after) (Gardner et al 2010) [4]. Twenty-five relevant studies were found that covered rugby union and rugby league players under twenty years old.

It was found that the incidence in rugby union players was 0.2 to 6.9 concussions per 1000 player-hours, which is equivalent to the probability of sustaining concussion in a season of 0.3 - 11.4%. In rugby league, the incidence was 4.6 - 14.7, and a probability equivalent to 7.7 - 22.7%.

There are a number of methodological issues with pooling data from different studies:

i) Different definitions of injury (eg: needing medical attention or not), and different measures (eg: 1000 player-hours; injuries per 1000 matches) (Brooks and Fuller 2006; appendix 1C).

ii) The person making the injury diagnosis (and report) (eg: doctors; self-reports). Williams et al (2013) commented that "it is difficult to ensure consistency in reporting and data collection practices across studies and teams. Factors such as the level of motivation, support and time available to data collectors within each team will influence the reported injury rates, particularly when considering minor injuries. Providing a breakdown of injury rates by team in multi-team injury surveillance studies would at least allow for some consideration of this effect" (p1053).

iii) The inclusion of injuries during training or not.

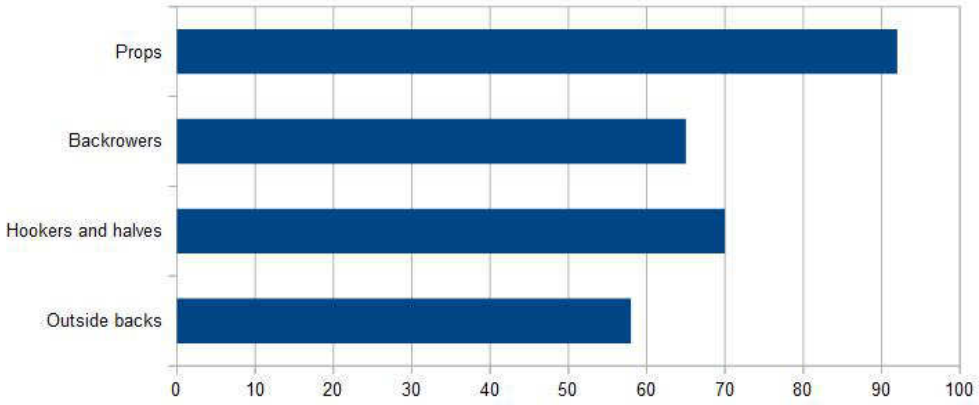
iv) In relation to concussion, Kirkwood et al (2015) noted that there can be "an under-reporting of concussion by players or coaches which needs to be considered... Concussions which don't involve LOC [loss of consciousness] or convulsions can be difficult to diagnose, symptoms may be inaccurately reported by athletes or they may withhold information in order to continue playing" (p4).

APPENDIX 1A - GABBETT (2005)

Gabbett (2005) collected data on the playing injuries of 156 semi-professional rugby league players in the 2000 and 2001 seasons in Queensland, Australia. The

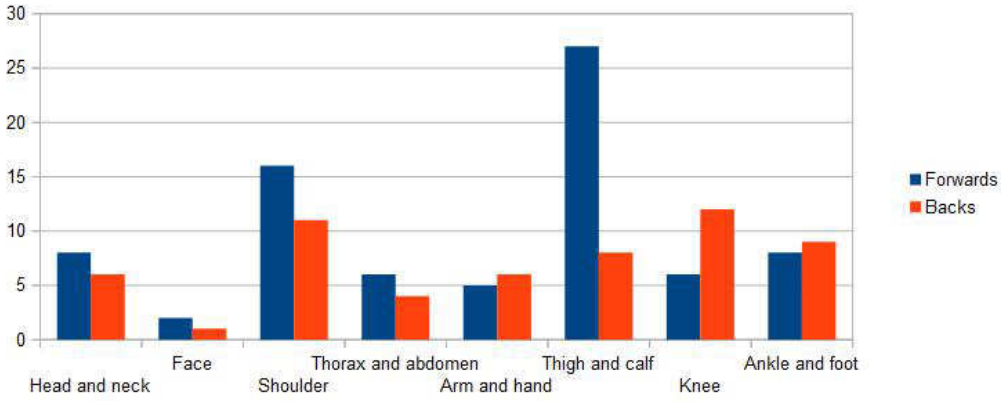
[4] Consequences of repeated concussions like poorer memory, and depression in later life have been reported for other sports like American football (eg: Guskiewicz et al 2005; appendix 1B).

overall incidence was 68 per 1000 playing-hours. But it was significantly higher in forwards than backs (80 vs 57), with the hooker being highest (101) and then props (92) (figure 1.1). The majority of injuries were to the thigh and calf, followed by shoulder and knee (figure 1.2), and tackles were the cause of the majority of them.



(Data from Gabbett 2005 table 2 p751)

Figure 1.1 - Mean incidence of injuries per 1000 playing-hours based on position in team.



(Data from Gabbett 2005 table 3 p751)

Figure 1.2 - Mean incidence of injuries per 1000 playing-hours based on site of injury.

APPENDIX 1B - GUSKIEWICZ ET AL (2005)

The researchers had 2552 retired professional American football players complete a general health survey, and then a sub-set of 758 self-reported and/or close relative-reported on memory. The latter group had

an average age of 62 years. Retired players with three or more reported game-related concussions [5] were five times more likely to be diagnosed with mild cognitive impairment (MCI), and three times more likely to have significant memory problems than players with no concussions. This was evidence of a dose-response relationship (ie: more concussions and more memory problems).

The researchers admitted: "Our study is influenced by the limitations of any retrospective self-report study. The study is limited by the uncertainty of how well the retired players recalled the concussions sustained during their careers and the accuracy of reporting memory problems and diagnosis of MCI" (p723). However, current memory status was confirmed by spouse or close relative, or physician's diagnosis. Ideally, "prospective longitudinal cohort studies are necessary to determine causality. Future prospective studies should implement genetic testing, more rigorous diagnostic criteria, historical documentation, and extensive serial evaluations (eg: neuropsychological testing, functional neuroimaging)..." (Guskiewicz et al 2005 p723).

APPENDIX 1C - BROOKS AND FULLER (2006)

Brooks and Fuller (2006) highlighted methodological problems with epidemiological studies using data on match and training injuries collected by medical personnel at twelve clubs in the English Premiership (rugby union) between 2002 and 2004 [6].

1. Reporting injuries

Injuries are usually reported as absolute number, proportions, or incidence, but only the latter gives the risk. In terms of proportions, 19% of match injuries were non-contact (and the remainder contact), but 57% of training injuries. This gives "the misleading impression that non-contact injuries are less of a problem during competition than they are during training when, in fact, the incidence of non-contact injuries was nearly 20-times greater during competition than during training" (Brooks and Fuller 2006 p462) (ie: 18 per 1000 player-hours in

[5] Defined as "an injury resulting from a blow to the head that caused an alteration in mental status and one or more of the following symptoms: headache, nausea, vomiting, dizziness/balance problems, fatigue, trouble sleeping, drowsiness, sensitivity to light or noise, blurred vision, difficulty remembering, and difficulty concentrating" (Guskiewicz et al 2005 p720).

[6] Details in Brooks et al (2005a; 2005b).

matches vs 1.1 in training).

Some studies combine match and training injuries into one figure, which can also be misleading "because the results depend on the ratio of training to match exposures and on the ratio of injury incidence during matches and training" (Brooks and Fuller 2006 p462). The combined incidence of injuries was 9, but this masks the incidence of 91 for matches and 2 per 1000 player-hours for training.

On the other hand, combined figures for proportion of specific injuries are distorted by match injuries. For example, hand and neck injuries are 4.6% of training injuries and 14.3% of match injuries, but 12.3% of combined injuries in Brooks and Fuller's data.

2. Injury definition

Definitions of injury tend to be based on needing medical treatment or loss-of-time from training and/or competition. The former definition "can generate large numbers of minor injuries and place high time-demands on the medical personnel involved in the studies, but they satisfy the argument that any injury can have a long-term impact on an athlete's health and should therefore be considered. However, pain and discomfort thresholds vary amongst players; therefore, whilst some players consult their physicians for minor conditions others wait until their condition becomes more serious. It is also difficult in retrospective studies for players to recall minor injuries" (Brooks and Fuller 2006 p463).

Loss-of-time definitions are problematic when comparing sports as "the same injury may cause a player to lose time in one sport but not in another sport" (Brooks and Fuller 2006).

Brooks and Fuller (2006) applied the four severity criteria to their data [7]:

- Missing one day or less of training or match - 91 per 1000 player-hours;
- Missing more than one day of training or match - 40;
- Requiring diagnostic tests - 25;
- Requiring surgery - 4.5.

The researchers stated: "The results obtained are all significantly different from each other, which demonstrates that, in general, it is meaningless to make inter-study comparisons of incidence values if the injury definitions are not the same" (Brooks and Fuller 2006

[7] Based on Orchard (1995).

p463).

Likewise, when using different exposure definitions:

- Injuries per 1000 player-hours of exposure: 91;
- Injuries per 1000 athlete-exposures: 96;
- Injuries per 1000 matches: 1815.

Even within one set of data, the exposure definition can produce different impressions. For example, in table 1.2 comparing injuries of players starting a match with substitutes, injuries per 1000 player-hours is different to the other two definitions.

Definition	Players starting a match	Substitution players
Injuries per 1000 player-hours	89	118
Injuries per 1000 athlete-exposures	114	43
Injuries per 1000 matches	1786	185

(Data from Brooks and Fuller 2006 table IV p464)

Table 1.2 - Different exposure definitions and Brooks and Fuller's (2006) data.

Then there is a problem in definitions that use loss-of-time in days compared to in matches. The incidence of injury was 18 per 1000 player-hours for loss of more than one day training or competition, but 35 if defined as loss of one match or more.

This is also seen in the type of injury: "using 'missing one or more matches' as the injury definition gave greater emphasis to more severe injuries (fractures/bone stress and joint [non-bone]/ligament), whereas using the '>1 day's absence from training and competition' gave greater emphasis to less severe injuries (muscle/tendon)" (Brooks and Fuller 2006 p465).

Definitions of recurrent injury in studies are either presented based on the judgment of the clinician assessing the injury or the same injury to the same body in the same season. From their data, Brooks and Fuller (2006) showed that the two definitions produced significantly different figures - 16 per 1000 player-hours for missing more than one day of training or competition using clinical judgment vs 10.2 for the other definition.

"The more severe an injury, the less likely it is that a player will be available to play again in the same season; therefore, the likelihood that a player with a

severe injury will experience a recurrence in the same season is reduced" (Brooks and Fuller 2006 pp465-466). For example, anterior cruciate ligament (ACL) injury (which has an average severity of 258 days) has no recurrence (0%) by same location definition, but 43% by clinical judgment definition, but a calf muscle injury (with an average severity of 12 days) has 11% recurrence by both definitions.

3. Sample size

The larger the better, particularly for sub-group analysis. Brooks and Fuller (2006) noted, for example, a significant difference in thigh match injuries for forwards and backs depending on the number of clubs in the sample.

4. Risk calculation

The risk associated with an injury is the incidence (ie: probability of an injury from a particular event) times the severity (ie: the consequences). For example, shoulder dislocation/instability and knee haematoma were both found to have an incidence of 1.3 per 1000 player-hours in competition, but the severity of the former was 81 days on average versus seven days. Therefore, the risk associated with shoulder dislocation/instability is much greater.

Just calculating incidence or severity by themselves is not the same as risk associated as shown in table 1.3.

Injury incidence	Injury severity	Injury risk
1. Thigh haematoma 2. Hamstring muscle 3. Concussion	1. Anterior cruciate ligament 2. Foot stress fracture 3. Tibia/fibula fracture	1. Anterior cruciate ligament 2. Shoulder dislocation/instability 3. Medial collateral ligament

(Data from Brooks and Fuller 2006 table IX p467)

Table 1.3 - Top three injuries by different definitions.

Calculating the risk of training is done by two methods - incident of injury as function of total training exposure time or specific exposure time for each type of training. The former definition presents "defence" training as highest risk of injury, for instance, while "rucking/mauling" training is a high risk by the latter definition.

5. Study design

Epidemiological studies of injuries can be categorised as descriptive (case reports, cross-sectional or correlational studies) or analytical (case-control, cohort or intervention studies).

Brooks and Fuller (2006) showed the difference in conclusions from the study design for cervical nerve root injuries and player's age in their data:

i) Case-control design - compares players with injury (cases) to those without (controls) in the same population.

ii) Two-group cohort design - compares players based on age (eg: below 23 vs 23 years and above).

iii) Four-group cohort design - eg: 19-22 years, 23-26 years, 27-30 years, and 31-34 years old.

The first design found that the average age of the two groups was 25.9 years for cases and 25.4 years for controls. The two-group cohort design found the incidence of 3.7 vs 2.6 per 1000 player-hours based on age. "Therefore, the case control study design indicated that younger players were less likely to experience a cervical nerve root injury but the cohort study design indicated that younger players had a higher incidence of cervical nerve root injuries than older players. The apparent anomaly occurs because case-control studies, unlike cohort studies, do not take into account the actual exposure of the players included in each group" (Brooks and Fuller 2006 p468).

The four-group cohort study design found incidences of 3.7 (19-22 years old), 2.5, 3,5 and 0.5 (31-34 years old), which suggested that 30 years old was the key age.

Brooks and Fuller (2006) concluded: "Although there are no simple solutions available to resolve the issues raised, the discussion demonstrates that it is important, at least within a sport, to reach consensus agreements on acceptable study designs and methods of data analysis and presentation. It has been demonstrated in cricket and football that consensus is achievable, as the first steps have been taken within these sports to reach an international agreement on the preferred methods of injury surveillance and data analysis. Whilst some variations in methodology will inevitably be required in order to address the specific objectives of individual studies, if broad consensus agreements on methodology are not obtained, it is clear that two independent studies, which approach the same problem within the same sport using different methodologies, could produce conflicting conclusions and recommendations. If this occurs, the

value of epidemiological studies of sport injuries is greatly reduced" (p470).

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2. TWO FACTORS THAT MAKE SUCCESSFUL DIETING DIFFICULT

Garaulet et al (2013) described obesity as a "heterogeneous condition", and that many factors influence the success of dieting - "physiological and psychological factors, some of which may carry a strong genetic influence, interact with environmental factors in a complex manner".

1. Timing of feeding and consistent eating.

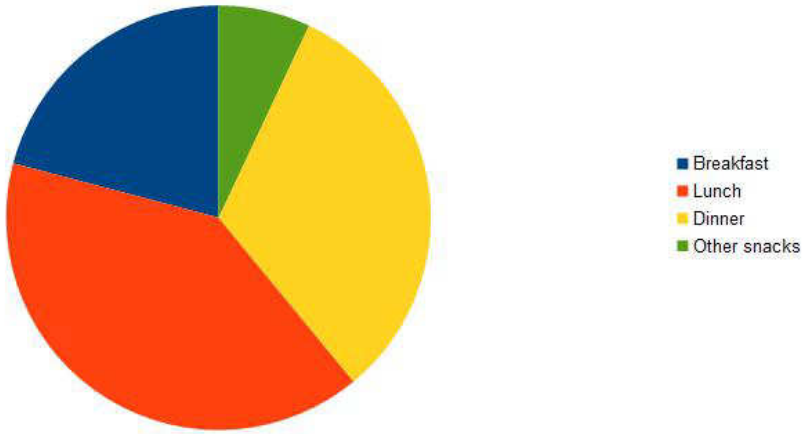
A simple idea that individuals will lose weight if their energy expenditure is greater than their caloric intake is challenged by evidence from animal studies that the timing of food intake is important. Unusual feeding time can disrupt the circadian system (that controls body cycles over the 24-hour period), and lead to weight gain however much is eaten. For example, Arble et al (2009) found that nocturnal mice fed a high-fat diet during the day gained more weight than the mice fed the same diet at night, while the return to the original timing prevented weight gain (Sherman et al 2012).

Researchers have reported the existence of a circadian clock in adipose (fat) tissue. "Taking into account that feeding is the source of energy for adipose tissue, the time of feeding, particularly for high energy content meals, may be decisive and changes in this timing could have metabolic consequences for the development of obesity and perhaps for weight loss" (Garaulet et al 2013).

Garaulet et al (2013) investigated this idea with over 400 overweight/obese volunteers in Spain seeking to lose weight on a twenty-week programme. As well as objective measures of weight and total body fat, participants kept dietary diaries of food eaten and timing of meals, along with physical activity details.

For analysis purposes, the participants were divided into early (n = 199) and late eaters (n = 212) for breakfast, lunch, and dinner based on the average times for these meals [8]. The late eaters lost significantly less weight than the early eaters, but only for the time of lunch, which was the largest meal of the day (figure 2.1) (an average of 2 kg less over the programme). This included controlling for energy expenditure and physical activity, and caloric intake, as well as sleep duration, chronotypes (morningness or eveningness), and genetic variation.

[8] Breakfast 9 am; lunch 3 pm; dinner 9.30 pm.



(Data from Garaulet et al 2013 table 3)

Figure 2.1 - Percentage of daily energy from each meal.

Linked to the timing of feeding is time-restricted feeding (TRF) (ie: food access for a limited period and fasting for the remainder of the time). For example, Hatori et al (2012) restricted access to high-fat food to eight hours per day during the active phrase for mice, and this prevented the adverse effects of such a diet.

Chaix et al (2014) varied the type of diet and the TRF in their study using 392 male mice. Mice that could eat whenever they wanted (ad libitum feeding; ABF) of a high-fat and high-sucrose diet [9] gained more body weight than mice on the same diet but time-restricted to nine hours per day over a twelve-week period (42% vs 21% body weight increase from baseline), despite both groups eating the same amount of calories. But there was no difference in body weight gain (6%) between ARF and TRF for a high-fructose diet [10].

When a high-fat diet [11] was available ALF or TRF for 9, 12 or fifteen hours per day over twelve weeks, greater availability led to greater weight gain (26% gain for 9 hours, 43% for 15 hours, and 65% ALF).

Other experiments by Chaix et al (2014) tested the legacy effect (ie: whether a change in diet can override the effects of the previous diet). First, over 12 weeks, there were five days of TRF and two days of ALF, which led to a 29% weight gain (compared to 61% in the ALF all the time).

Second, mice placed on thirteen weeks of TRF

[9] 25% energy from sucrose/32% from fat.
[10] 60% energy from fructose/13% from fat.
[11] 62% energy from fat.

followed by 12 weeks of ALF gained as much weight as ALF 25 weeks, while the TRF 25 weeks had under half the increase.

Next, mice on ALF for thirteen weeks were switched to TRF for 12 weeks, and they showed a drop in body weight after the change (5%), and mice on 26 weeks of ALF followed by 12 weeks TRF had a 12% drop in body weight after the switch.

Summing up, mice on a high-fat diet ALF gained weight, but TRF for twelve hours or less was protective against this gain. Transferring mice on ALF to TRF limited overall weight gain. Importantly, TRF does not work by reducing caloric intake, as ALF and TRF mice ate the same amount.

"Consistent eating" (CE) involves having similar mealtimes each day, and eating similar quantities (eg: larger meal at lunch-time each day). Vainik et al (2015) pointed out that this idea "does not imply having exactly the same food every day. Rather, people can have varied individual food items as recommended,... but their day-to-day meals are consistent in terms of energy content and healthiness".

External food cues challenge CE in the form of, for example, food marketing, and the wide availability of food. In the evolutionary past, eating food when available was a good strategy to deal with food scarcity, but "in today's world full of appetitive temptations, over-reliance on external food cues can be a disadvantage" (Vainik et al 2015).

Vainik et al (2015) investigated the personality and situational factors involved in CE with 195 women recruited in Montreal. Over ten days the participants were prompted six times per day [12] to complete a questionnaire about their mood, food eaten, and events in the previous two hours (table 2.1) [13]. This is the Experience Sampling Method. Prior to the study, participants were asked to describe their typical meals and times of eating. Questionnaires were also completed at this time on personality.

Approximately 60% of meals were classified as consistent, and the remainder as inconsistent along the dimensions, larger-smaller or healthier-unhealthier (figure 2.2). Eating later, eating with others, eating away from home, having consumed alcohol, and doing physical exercise were all associated with inconsistency. Self-control as a personality trait was associated with CE, but this interacted with fatigue, particularly in the evening (with less consistency at this time).

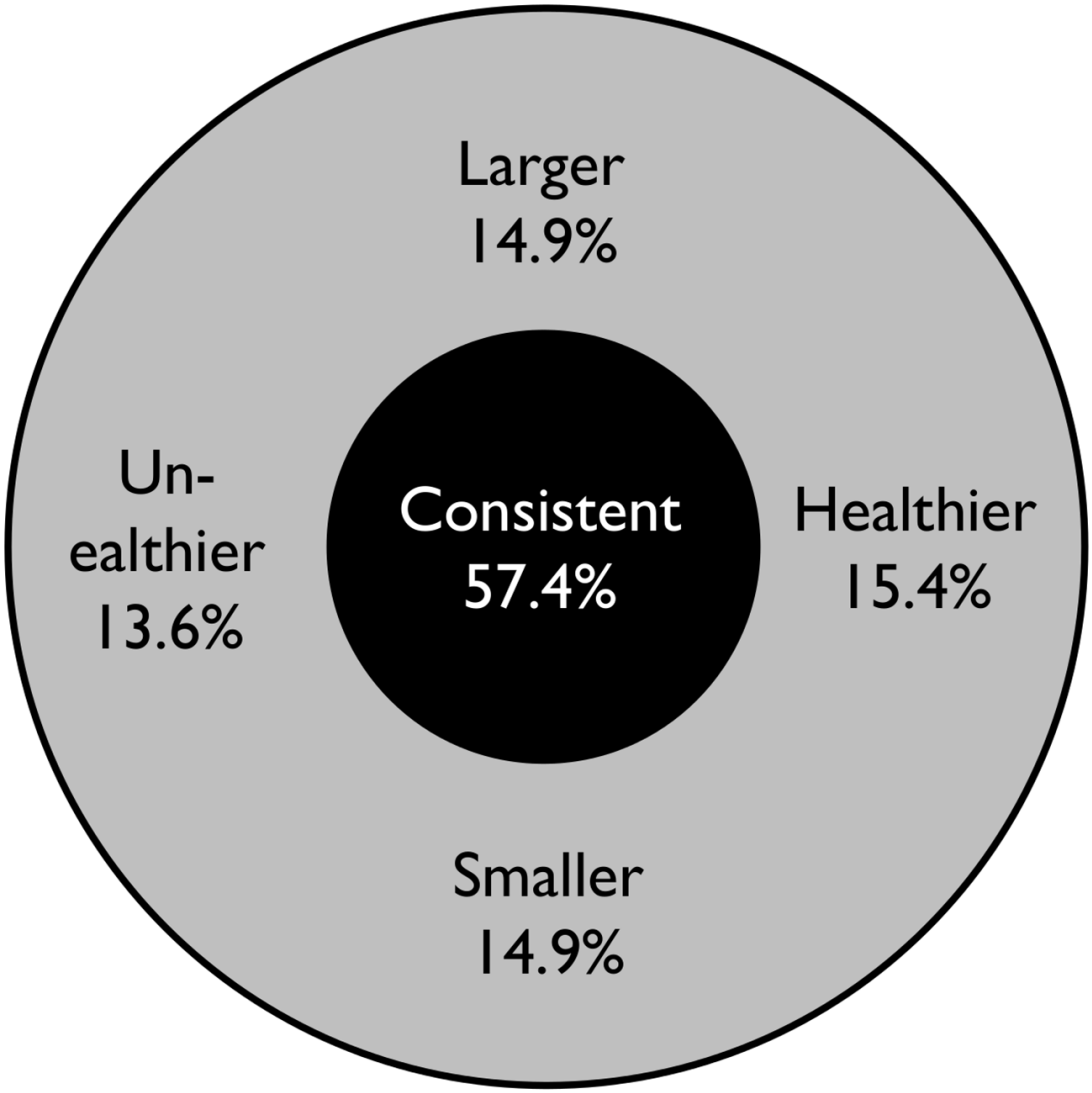
[12] The first prompt each day was around 9 am.

[13] All measures were subjective with no attempt to objectively verify the amount eaten, for example.

- "In the last 2 hours... If you have eaten a meal, how does this meal compare to the typical meal you generally take at the same time of the day in terms of composition (ie: the types of food you had): same as usual, healthier food than usual, or less healthy food than usual".

- If a meal had been eaten - it was coded as 0 if eaten at home or 1 if eaten away from home; also if eaten alone (0) or with others (1).

Table 2.1 - Examples of questions to be completed at every prompt.



(Source: Vainik et al 2015 figure 1)

Figure 2.2 - Percentage of eating classified as consistent and inconsistent.

There was an interaction between restrained eating and alcohol, for instance, such that unrestrained eaters were less consistent after consuming alcohol and restrained eaters more consistent. Polivy and Herman (1976) had found that "alcohol leads to an elevated mood which facilitates less retrained people to restrain even less, and more restrained people to restrain more" (Vainik et al 2015).

2. Restrained eating

Dieting can reduce weight, but maintaining the loss is the problem. Lowe et al (2013) found that dieting actually lead to weight gain when associated with restrained eating. There are a number of psychological factors related to this, including (Markey 2015):

i) The "what the hell effect" (Herman and Polivy 1984).

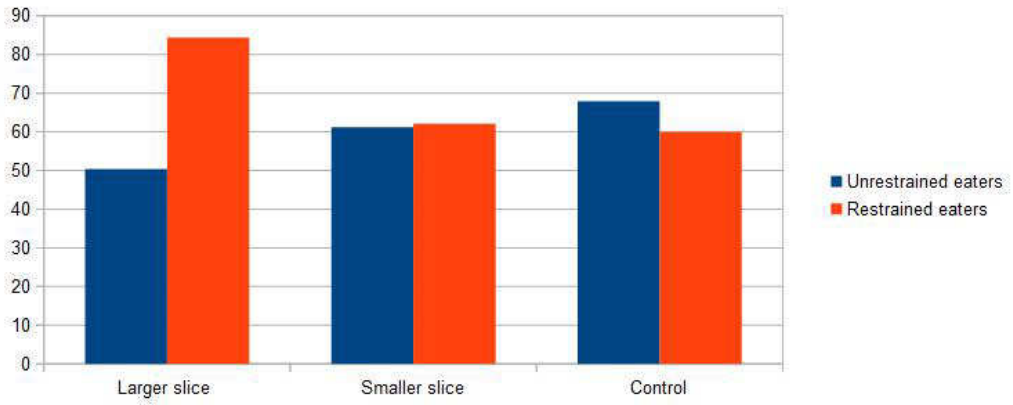
This is the tendency to binge if the individual fails to restrict their eating (ie: loses self-control).

Human meals today often have multiple courses. How much is eaten in the earlier courses (known as the "pre-load") will influence how much is eaten in the later courses. Unrestrained eaters reduce their intake in the later courses after a large pre-load compared to a small pre-load. Chronic dieters or restrained eaters show the opposite pattern - "eating more after a large pre-load than after a small pre-load or after no pre-load... Presumably, the larger pre-load is more likely to sabotage the restrained eater's diet for that day, undermining motivation for continued restraint and unleashing disinhibited eating (possibly potentiated by chronic perceived deprivation). If the pre-load is actually large and fattening, it is likely to produce disinhibited eating by restrained eaters..., but disinhibition may be observed even when the restrained eater is merely led to believe that the pre-load is high in calories or otherwise forbidden... or when the restrained eater draws that implication from the nature of the food itself..." (Polivy et al 2010 p426).

Studies have manipulated the perceived size of the pre-load. For example, giving a pre-load of a milkshake (perceived as high in calories) as opposed to cottage cheese (perceived as low in calories) of the same caloric value leads to greater eating for restrained eaters (Knight and Boland 1989). Other studies have lied about the calories in a pre-load, or asked participants to imagine that the food is higher in calories (Polivy et al 2010).

Polivy et al (2010) manipulated the perceived size of the pre-load using comparison between different portion sizes. The researchers predicted that restrained eaters would eat more food if they perceive that the pre-load is larger than the average portion size ("because the 'large' portion is more likely to break their diets and lead to disinhibited eating"), whereas unrestrained eaters would eat less after a larger perceived pre-load. All Canadian female undergraduate participants received the same pre-load (pizza slice), but either saw the norm was larger slices ("smaller slice" condition), or smaller slices ("larger slice" condition) than themselves, or saw no other pieces (control condition). Then the participants had the opportunity to eat as many cookies as they wanted in a tasting test.

For analysis purposes, the 106 participants were divided into restrained or unrestrained eaters based on their responses on the Herman and Polivy Revised Restraint Scale (Herman et al 1979). Restrained eaters in the large slice condition ate the most cookies, and unrestrained eaters in this condition the least (figure 2.3).



(Data from Polivy et al 2010 table 1 p428)

Figure 2.3 - Mean amount of cookies eaten (grams).

Interestingly, restrained eaters rated their emotions more negatively in the smaller slice condition (which was the opposite of unrestrained eaters). Polivy et al (2010) speculated thus: "Unrestrained eaters may be responding to the prescriptive norm of not appearing to eat excessively..., and feel worse if they think that they are violating the norm. Restrained eaters, on the other hand, may actually be more upset with being allowed to maintain their diets (by eating the smaller piece); apparently they feel somewhat better when 'forced' by the experimenter to eat 'more', break their diets, and

indulge themselves with additional cookies. This interpretation comports with the assumption that fundamentally, people want to eat as much as possible, but are constrained by considerations of social propriety (not eating excessively so as not to look like a 'pig') or their self-imposed dietary agendas... When forced by someone else to transgress against their diets, restrained eaters may well experience what we have called the 'what the hell effect'... and feel relieved to be pushed off their diets and allowed to unleash their eating" (pp429-430).

The researchers summed up the implications of their findings: "The data also show that restrained and unrestrained eaters alike judge the amount that they are served in comparison to what those around them are eating. Such perceptions about the social context or meaning of one's portion apparently outweigh feelings of hunger in influencing the amount eaten, particularly if one sees oneself as having overeaten relative to others. Restrained eaters, when they perceive themselves as having eaten excessively compared to others, continue to eat liberally rather than curtail their intake. This indulgence undermines their stated dietary goals, but the fact that they feel worse when they do not (get to) overindulge provides a hint as to why dieters so often find themselves breaking their diets" (Polivy et al 2010 p430).

ii) Thought suppression.

Attempting to avoid thinking about something (thought suppression) leads to an increase in intrusive thoughts (ie: thinking about the something) rather than a reduction, and to thought rebound (the return of the suppressed thoughts more strongly later) (Erskine and Georgiou 2010).

Applied to eating, Erskine (2008) found that suppressing thoughts about chocolate led to greater consumption of chocolate later than for individuals not involved in thought suppression.

Polivy et al (2005) deprived participants of chocolate or vanilla for one week, and then offered chocolate. Restrained eaters who were deprived on chocolate ate more chocolate than the vanilla-deprived or control (non-deprived) groups, and unrestrained eaters. These individuals also reported more cravings for chocolate during the week of deprivation.

Soetens and Braet (2006) found that teenage restrained eaters who were also obese showed thought rebound after suppressing thoughts about food, while non-obese individuals and unrestrained eaters did not.

Soetens et al (2008) exposed participants to their favourite food for twenty-four hours by wearing a bag

containing it, while half were prohibited from eating it. When given the opportunity to eat this food, the prohibited group consumed more, but restrained eaters who had been prohibited ate the most.

In an experiment with 116 undergraduates at a university in England, Erskine and Georgiou (2010) got participants either not to think about chocolate (suppression) or concentrate on it (expression) or have unrelated thoughts (control) for five minutes before tasting chocolate. Participants were divided into restrained or unrestrained eaters based on the Restraint Scale (Herman and Polivy 1980), which has ten items, like "Do you have feelings of guilt after overeating?". Participants completed the White Bear Suppression Inventory [14] (WBSI) (Wegner and Zanakos 1994) afterwards, which measures the use of thought suppression with fifteen items, like "There are things I prefer not to think about".

The dependent variable was the amount of chocolate eaten from two bowls containing twenty "Maltesers" and twenty "Galaxy Minstrels".

Non-restrained eaters showed no difference in the number of chocolates eaten based on the condition (around six), but the restrained eaters in the suppression condition consumed significantly more (approximately twice as many) than the other two conditions. The researchers stated: "Therefore it seems that restrained eaters are especially susceptible to the behavioural effects of thought suppression. This suggests that use of thought suppression among restrained eaters is a risk factor for overeating. However, the present study also collected data on participants' routine use of thought suppression and showed that restrained eaters are not more likely to use thought suppression than non-restrainers per se. Thus, restrained eaters did not report greater use of thought suppression in everyday life than non-restrained eaters in the current study" (Erskine and Georgiou 2010 p502).

Restrained eating involves self-control, self-regulation and concentration, and such executive control processes are limited in amount, according to the strength model of self-control (Muraven and Baumeister 2000). When the resources are used up ("ego depletion"), then self-control is reduced [15].

For example, Hagger et al (2013) found that overweight individuals who were on a diet struggled to reduce food intake after a cognitive task that led to

[14] This is named after the original work that asked participants not to think about a white bear.

[15] The ego depletion effect can be reduced by incentives for self-control (eg: Muraven and Slessareva 2003).

mental fatigue.

While in a three-week study, Wang et al (2015) found that ego depletion reduced success in achieving personal goals among 203 Chinese students. All participants chose a goal from a list of six to achieve during the study period (eg: spend 50 minutes jogging per day; skip dinner). At the end of each day, the participants scored their success in achieving the goal, the mental effort involved, and their motivation for the goal on a scale of 0-10. Life events that could lead to ego depletion were also recorded. There was a negative correlation between ego depletion level and success in achieving goal - ie: high ego depletion and low success, and vice versa.

GOOD NEWS

On the positive side, moderate weight loss (5% of body weight) has beneficial effects (Magkos et al 2016). This is less than the recommended 10% loss for health improvements, and "it is much easier to achieve 5% weight loss than it is to achieve a 10% weight loss" (Magkos et al 2016). However, greater weight loss did lead to greater health benefits. Magkos et al (2016) compared the physiological changes in forty sedentary obese individuals, half of whom were randomly assigned to a weight loss programme for about 6-12 months.

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3. TWO BRIEF EXAMPLES OF HUMAN IMPACT ON NATURAL WORLD

3.1. THE REMOVAL OF FEAR

Large carnivores (eg: wolf, lion) at the top of the food chain play a role that affects both large herbivores (eg: bison, deer) and meso-carnivores (smaller semi-carnivores that are also prey of the large carnivores). As well as eating these animals, the presence of large carnivores produces a "landscape of fear" (Laundre et al 2001) which causes the prey to eat less (Suraci et al 2016).

Human-large carnivore conflict has led to the removal of the carnivores in some places, with consequences for the whole food chain/ecosystem.

In the case of small coastal Gulf Islands in British Columbia, Canada, the removal of large carnivores like the wolf has allowed the raccoon (meso-carnivore) to flourish. This has consequences for their prey (eg: crabs and inter-tidal fish) (Suraci et al 2014) as the raccoons have unrestrained foraging (ie: during night and day when normally nocturnal, and rarely looking up during eating).

On four of these islands [16], Suraci et al (2016) performed a field experiment to see if fear of predation would have an impact on the raccoons (Procyon lotor) (figure 3.1). On each island, daily for one month, the researchers played a few seconds of domestic dog barking (large carnivore) or seal calls (control). This was a repeated measures design. The outcome measures were the observation of the raccoons' behaviour, and the number of prey species counted in sampling quadrants.

The fear of a large carnivore significantly reduced foraging by the raccoons, who left the area on hearing the playback of the dog, and subsequent spent less time in that area (66% less time foraging there over the month of the playback). The prey species showed a significant increase in numbers after the month of dog playback.

The researchers summed up: "Our experiment reversed...[raccoon] unrestrained foraging by restoring the fear of large carnivores to a system from which it has largely been lost, revealing the significance of the ecosystem service the presence of the now extirpated large carnivores (wolves, cougars and black bears)

[16] Coal Island, Portland Island, Wallace Island, and Penelakut Island.

(Source: D Gordon E Robertson)

Figure 3.1 - Female raccoon.

provided, solely through the fear they inspired" (Suraci et al 2016 pp3-4).

3.2. NO NEED TO MOVE

It has been observed that previously wholly migrating birds in Europe are not wintering in Africa, but forming resident populations (Newton 2007). Global environment change may play a part, and so does human society.

For example, landfill sites in Iberia provide a winter food supply for white storks (Ciconia ciconia) (figure 3.2). The number of white storks in this area has increased over ten-fold in the twenty-first century (Gilbert et al 2016).

Gilbert et al (2016) attached tiny data loggers to forty-eight of these birds captured around five landfill sites in Portugal between 2012 and 2014. The loggers transmitted location via GPS, and movement (via an accelerometer) five times per day. The data were then classified into four behaviour categories - inactive (eg: standing), foraging, flight, and tending eggs. The birds were tracked for an average of nine months. The closer a bird was nesting to a landfill site, the shorter the distance flown.

(Source: In public domain)

Figure - White stork.

This study was the "first confirmation of year round nest use, an entirely new behaviour that has developed as the Iberian population of white storks shifted from being wholly migratory to partially migrant" (Gilbert et al 2016 p8). Previous monitoring studies (eg: Blanco 1996) had not found that storks occupied their nests all year round.

Migration and residency involve costs and benefits. For example, staying put during the winter (residency) is challenging (eg: temperature, food), but offers higher breeding success from having the best breeding sites, and does not cost the energy of migration (Gilbert et al 2016).

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