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This Core Studies guide is just a starting point for teachers and students. It is important that students understand the studies in-depth in order to answer any assessment questions. The assessment questions may ask them to extrapolate information from the studies or take their understanding of the studies and what they have taught us further.

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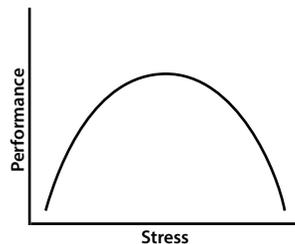
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# The inverted-U hypothesis: A catastrophe for sport psychology. Fazy, J. and Hardy, L. (1988), *British Association of Sports Sciences Monograph, No. 1*, Leeds: The National Coaching Foundation.

## 1. Theory/ies on which the study is based

- The inverted-U hypothesis describes how performance initially increases with the increase in intensity of a stimulus, but then performance tails off if the intensity or frequency of the stimulus continues to increase.
- A principal feature of the inverted-U hypothesis is the prediction of a gradual tailing-off of performance once an optimal level of stress is passed, the corollary being that once a performer has gone 'over the top' all that is required to reinstate peak performance is a slight reduction in stress. See Figure 1 below:

Figure 1: A traditional representation of the inverted-U hypothesis



- The inverted-U hypothesis was extended by Oxendine (1970) to describe the relationship between 'arousal' and motor performance in a range of different conditions. In this context, arousal was taken to be a unitary construct embodying both psychological and physiological response systems, and reflecting the potential energy available to the organism for release during subsequent behaviour (Duffy, 1962). Arousal was therefore identified as a mediating variable between stimulus and response, and was usually determined in practice by measuring the intensity of some behaviour or somatic response which was assumed to co-vary with the underlying potential energy of the organism.
- The inverted-U hypothesis has been variously stated as a relationship between stress and performance, arousal and performance, and/or anxiety and performance.
- Catastrophe theory was first developed by René Thom (1975) as a means of modelling certain naturally occurring discontinuities in functions which were normally continuous. His original theory showed that any catastrophe which might naturally occur in real time and space can be classified as being of the 'same type' as one of seven elementary catastrophes (fold catastrophe, cusp catastrophe, swallowtail catastrophe, butterfly catastrophe, hyperbolic catastrophe, elliptic catastrophe, parabolic catastrophe).

# The inverted-U hypothesis: A catastrophe for sport psychology. Fazy, J. and Hardy, L. (1988), *British Association of Sports Sciences Monograph, No. 1*, Leeds: The National Coaching Foundation.

## 2. Background to the study

- The inverted-U hypothesis originated from a study of habit-strength formation in mice under different conditions of punishment stimulus frequency (Yerkes and Dodson, 1908).
- The inverted-U hypothesis was extended by Oxendine (1970) to describe the relationship between 'arousal' and motor performance in a range of different conditions. Oxendine's extended hypothesis has received some experimental support (e.g. Martens and Landers, 1970; Klavara, 1978; Sonstroem and Bernado, 1982).
- The intuitive appeal of Oxendine's version of the inverted-U hypothesis has been enhanced by its ability to cope with successive theoretical explanations of the relationship between stress and performance e.g. Easterbrook's (1959) cue utilisation theory, Wine's (1971) theory of divided attention.
- Fazy and Hardy claim there are at least three issues which present serious problems for the inverted-U hypotheses as it stands:
  - (i) Difficulties with the basic constructs involved in the hypothesis.
  - (ii) Lack of consideration of situational specificity and the multidimensionality of the stress response.
  - (iii) Experiential evidence from sport psychology regarding the symmetry of the stress-performance relationship.
- This study considers these three issues and then proposes two catastrophe models of motor performance under anxiety which attempt to describe the relative contributions to performance of cognitive anxiety, 'on the day' physiological arousal, task difficulty and self-confidence.

## 3. Research method

- This is a monograph (a specialist work of writing on a single subject or an aspect of a subject, usually by a single author) which identifies and considers three different areas of difficulty associated with the inverted-U hypothesis.
- The authors then propose an alternative model, based on Zeeman's (1976) Cusp Catastrophe, which aims to clarify the relationship between cognitive anxiety, physiological arousal and motor performance. The idea of the first model is a three-dimensional response surface in which cognitive anxiety acts as a splitting function that determines the nature of the relationship between physiological arousal and performance: when cognitive anxiety is low, the curve representing the relationship is the familiar inverted-U shape, but when cognitive anxiety is high, the curve becomes discontinuous, with a catastrophic fall-off in performance occurring once the optimal peak is passed. The second model is an extension of the first and describes the possible roles for self-confidence and task difficulty in the anxiety-performance relationship.
- A number of testable hypotheses of the model are stated, together with an extension of the model to a higher-order butterfly catastrophe which describes possible roles for self-confidence and task difficulty in the anxiety-performance relationship.

# The inverted-U hypothesis: A catastrophe for sport psychology. Fazy, J. and Hardy, L. (1988), *British Association of Sports Sciences Monograph, No. 1*, Leeds: The National Coaching Foundation.

## 4. Outline of the identified difficulties with the inverted-U hypothesis

### Difficulties with the basic constructs

- In line with Cox (1981) *stress* will be regarded as an intervening variable referring to a state of perceived incongruity between stimulus demands and behavioural output capacity.
- Unlike Cox (1981) and Appleby (1964), *stress* will not be regarded as necessarily implying a threat to the organism. Rather, it will be regarded only as an interaction between the organism and its situation, which interaction is perceived to require some adjustment to the present state of readiness. Such situations can be viewed by the individual as either challenging or threatening.
- Therefore, if the inverted-U hypothesis is to be considered as a statement about the relationship between stress and performance, supporting evidence must be produced which takes account of both the actual demands of the situation and the performer's perception of these demands.
- The concept of *anxiety* can be defined as feelings of insecurity as a result of perceived inability to cope with a stressful environment (Spielberger, 1966).
- As well as the distinction which can be made between *state* and *trait anxiety*, recent literature has suggested the need to differentiate further between *cognitive* and *somatic anxiety* in both traits (Davidson and Schwarz, 1976; Borkavec, 1976) and states (Morris, 1981; Martens et al., 1984; Hardy and Whitehead, 1984).
- Therefore if the inverted-U hypothesis is a statement about anxiety and performance, it must make these distinctions. To date, few experimental studies have done so.
- *Arousal* is generally taken to be a unitary construct which mediates the effects of stress upon performance. This unified concept of arousal has persisted in spite of research which suggests the relationship is not as simple as this (e.g. Lacey, 1967; Hardy and Whitehead, 1984; Hockey and Hamilton, 1983).
- The authors feel there should be a distinction between *physiological arousal*, which may or may not be multidimensional; and activation, which refers to the availability of those cognitive and somatic functions required for performance. These functions include e.g. perception, long-term memory, balance and manual dexterity.  
Therefore, with this distinction two questions in relation to the inverted-U hypothesis need to be addressed:  
(i) If physiological arousal is a unitary construct, then is it related to performance by an inverted-U function?  
(ii) Does this say anything about a systemic relationship between stress and performance?

### Difficulties with the corroborative evidence

- No previous research has considered the influence of the different anxiety systems on the stress response, or the possibly different effects of increasing and decreasing stress levels.
- There is still little convincing, sound experimental evidence for the inverted-U hypothesis as a model of the relationship between stress and performance.

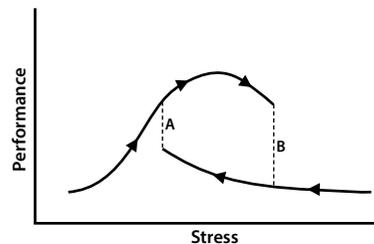
# The inverted-U hypothesis: A catastrophe for sport psychology. Fazy, J. and Hardy, L. (1988), *British Association of Sports Sciences Monograph, No. 1*, Leeds: The National Coaching Foundation.

## 4. Outline of the identified difficulties with the inverted-U hypothesis . . . continued

### Difficulties in applying the model

- Fazy and Hardy's experiences when working with athletes performing in potentially highly stressful situations did not engender any real confidence that the traditional inverted-U concept was applicable. Instead, it appeared that when an athlete went 'over the top' two things occurred:
  - (i) The drop-off in performance was very large and dramatic (not a process of getting gradually worse)
  - (ii) Once the athlete started to experience such a performance disaster in competition it was very difficult to get performance back to even a mediocre level. This suggested that small reductions in the stress being experienced by the athlete made no real difference to performance once this stage had been reached.
- Fazy and Hardy therefore proposed a model that showed that as stress increased so too did performance until a critical point was reached where it suddenly and dramatically fell to a very low level. In addition, their model proposed that once a performer was on the lower curve, it required a considerable reduction in stress for him/her to be able to jump back onto the upper performance curve (see Fig 2 below):

Figure 2



### To summarise

- Fazy and Hardy present three major criticisms of the inverted-U hypothesis:
  - (i) The failure to recognise the multidimensionality of the anxiety and arousal systems.
  - (ii) The general lack of sound experimental support for the detailed predictions of the hypothesis.
  - (iii) The apparent lack of predictive validity in practical situations.

# The inverted-U hypothesis: A catastrophe for sport psychology. Fazy, J. and Hardy, L. (1988), *British Association of Sports Sciences Monograph, No. 1*, Leeds: The National Coaching Foundation.

## 5. Outline of the two proposed catastrophe models

- Fazy and Hardy discuss two alternative approaches that have been used to study the effects of stress upon performance. They then integrate some of the ideas from these two approaches into the proposal of a 'catastrophe' model of anxiety and performance.

### Multidimensional activation and anxiety

- Recent research into the effects of stress upon performance has focused largely on multidimensionality, either in terms of disruption to activation states, or in terms of the anxiety response to stress e.g. Hockey and Hamilton (1983) argued that qualitatively different stressors induced uniquely configured cognitive activation states, which influence performance via the availability of information-processing resources. Using white noise as the primary stressor to demonstrate such activation states, they found that loud noise increased attentional selectivity, speed of information transfer and the long-term recall of well learned items.
- An alternative approach has been to consider the self-reported and psycho-physiological response to stress. E.g. Davidson and Schwarz (1976), Borkovec (1976), Morris et al. (1981), Martens et al. (1984) identified at least two components of anxiety:
  - (i) Cognitive anxiety (worry)
  - (ii) Somatic anxiety (perception of the physiological arousal response).
- Research has suggested a dissociation between these two components with cognitive anxiety being high and stable for anything up to two weeks before a major event, while somatic anxiety peaks late and fast immediately before the event.
- Early correlational studies (e.g. Morris et al., 1975) suggested that cognitive anxiety was the principal influence upon motor performance in a significant event. However, a fundamental implication of this suggestion is that things should not suddenly go wrong on the day – any disruption to performance should occur as soon as cognitive anxiety is elevated i.e. several days before the significant event.
- In contrast, Humphreys and Revelle's(1984) model predicts that the physiological response which is associated with anxiety should have at least some effect on short-term memory and sustained information transfer.
- Recent research has used the time-to-significant-event paradigm to dissociate the cognitive and somatic components of competition anxiety and so investigate the separate effects of these components upon different cognitive and motor sub-components of performance. Parfitt and Hardy (1987), in a study of basketball players, used an analysis of group effects, and found that cognitive anxiety was positively related to rebound shooting, whilst somatic anxiety was positively related to the height attained in a sergeant jump, but negatively related to scores in short-term memory and motor-agility tasks, both of which contained a fairly high decision-making component. This finding that cognitive anxiety appeared to have a positive rather than a negative effect on performance, whilst somatic anxiety seemed to have an even greater influence, which could be either positive or negative, was in stark contrast to the conclusions drawn by Morris et al. (1975).

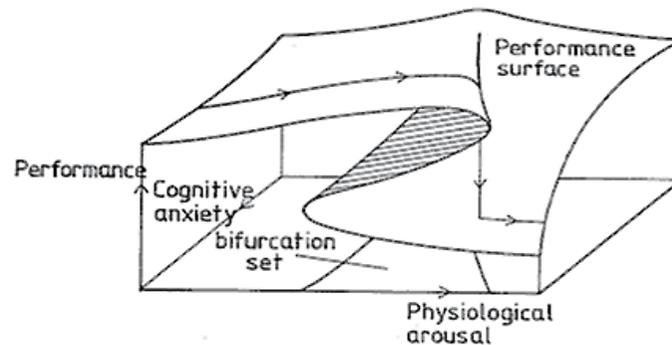
# The inverted-U hypothesis: A catastrophe for sport psychology. Fazy, J. and Hardy, L. (1988), *British Association of Sports Sciences Monograph, No. 1*, Leeds: The National Coaching Foundation.

## 5. Outline of the two proposed catastrophe models . . . continued

Catastrophe model of anxiety and performance

- Fazy and Hardy's catastrophe model of anxiety and performance is shown in the Figure 3 below:

Figure 3: A cusp catastrophe model of the effects of anxiety upon performance



- The model assumes that anxiety has at least two components, cognitive anxiety and the physiological arousal response. In this context, physiological arousal is regarded as the degree of generalised sympathetic physiological response which may be reflected at least partially by somatic anxiety or any other physiological indicator. Cognitive anxiety is proposed as a splitting factor which determines whether the effect of physiological arousal (the normal factor) is smooth, and small, large and catastrophic, or somewhere between these two extremes.
- This model fits existing data which shows a negative relationship between cognitive anxiety and performance and mixed positive and negative effects for physiological arousal upon performance under conditions of high cognitive anxiety. This however begs the question of how cognitive anxiety alters the effect of physiological arousal upon performance. The most plausible answer may be that performers have a greater tendency to demonstrate higher levels of performance under conditions of high physiological arousal in simple or well learned tasks when they are able to control or suppress any adverse physiological effects whilst utilising the beneficial effects (parfait and Hardy, 1987). It is possible that cognitive anxiety disrupts this control by distracting the performer's attention (Wine, 1971), and by creating doubt at a conscious or subconscious level about what is a beneficial physiological effect and what is an adverse physiological effect. Consequently, in tasks where the physiological demand is high and the cognitive control demand low, cognitive anxiety might lead to enhanced performance when physiological arousal is high. Conversely, in tasks with a low physiological demand but a high control demand, cognitive anxiety would usually lead to a decrease in performance under conditions of high physiological arousal (Eysenck, 1982).

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## 5. Outline of the two proposed catastrophe models . . . continued

- Fazy and Hardy's proposed catastrophe model makes the following testable predictions:
  - (i) Physiological arousal (and any associated somatic anxiety) is not necessarily detrimental to performance. However it will be associated with catastrophic effects when cognitive anxiety is high.
  - (ii) Under conditions of high cognitive anxiety, hysterics will occur i.e. performance will follow a different path as physiological arousal increases from the path it follows as physiological arousal decreases. Under conditions of low cognitive anxiety, hysterics will not occur.
  - (iii) Intermediate levels of performance are most unlikely in conditions of high cognitive anxiety.
  - (iv) It should be possible to fit precise cusp catastrophes to real life data using statistical methodology (using Olivia et al., 1987).

### The Kirkcaldy model

- Kirkcaldy (1983) attempted to describe stress effects upon sports performance in terms of cortical arousal and anxiety. The model was based on the drive theory approach to stress and performance which equated drive with cortical arousal and predicted a positive linear relationship between cortical arousal and performance. If Kirkcaldy's prediction is correct, peak performances should be obtained much more often than flop catastrophes at major competitions. This prediction does not appear to fit with anecdotal reports on competition behaviour.

### The Booth model

- Booth (1985) attempted to describe the effects of test anxiety upon examination performance via a different catastrophe model involving worry (cognitive anxiety) and emotionality (somatic anxiety). However this model was also found to have serious shortcomings e.g. it ascribed symmetric roles to cognitive and somatic anxiety which is at considerable odds with experimental literature (e.g. Morris et al., 1981; Parfitt and Hardy, 1987).

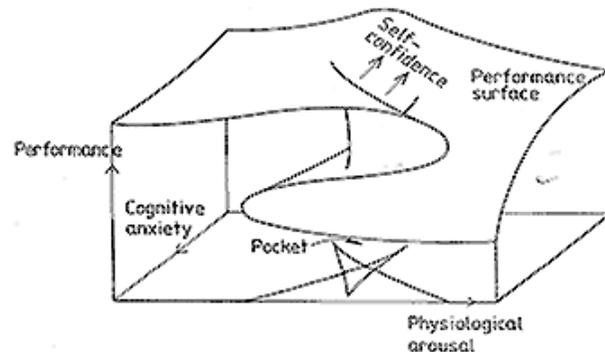
### Higher dimensional catastrophes

- Although Fazy and Hardy's catastrophe model may be considered an acceptable description of the roles of cognitive anxiety and physiological arousal in performance under stress, there may be other influences upon performance under such conditions e.g. task difficulty, self-confidence.
- Fazy and Hardy therefore extended their model to a higher-order butterfly catastrophe which describes the possible roles for self-confidence and task difficulty in the anxiety-performance relationship. Task difficulty is included as a bias factor and self-confidence as a butterfly factor. Thus the physiological arousal level at which catastrophes occur in cognitively anxious individuals gradually shifts to the left as cognitive processing demands of the task increase. Such a proposal is in line with previous findings for both the inverted-U hypothesis (Yerkes and Dodson, 1908) and the effects of physiological arousal and performance anxiety upon tasks with differing cognitive processing demands e.g. Humphreys and Revelle, 1984; Baddeley and Idzikowski, 1985). Conversely, self-confidence allows the cognitively anxious performer the possibility of regaining the smooth stable area of performance at the back of the behaviour surface via a third intermediate behaviour surface. This possibility is increased when self-confidence is very high, or when cognitive anxiety is not extreme. This model is shown in overleaf.

# The inverted-U hypothesis: A catastrophe for sport psychology. Fazy, J. and Hardy, L. (1988), *British Association of Sports Sciences Monograph, No. 1*, Leeds: The National Coaching Foundation.

## 5. Outline of the two proposed catastrophe models . . . continued

Figure 4: a butterfly catastrophe model of the effects of cognitive anxiety, physiological arousal, task difficulty and self-confidence upon performance



- The extended catastrophe model allows the following predictions to be made:
  - (i) Difficult tasks with a high processing load shift the hysteresis loop to the left, while simple tasks making few demands upon the cognitive system shift the loop to the right.
  - (ii) Under conditions which induce intermediate levels of cognitive anxiety, individuals who possess a high degree of self-confidence will demonstrate a trimodal distribution for performance. Conversely, at more extreme levels of cognitive anxiety, the same individuals will produce bimodal performance-distribution curves. In particular, intermediate levels of performance are possible only for confident performers or at relatively low levels of cognitive anxiety.
  - (iii) The butterfly catastrophe model can be fitted to real life performance data using the statistical methodology of Olivia et al. (1987).

## The inverted-U hypothesis: A catastrophe for sport psychology. Fazy, J. and Hardy, L. (1988), *British Association of Sports Sciences Monograph, No. 1*, Leeds: The National Coaching Foundation.

### 6. Possible conclusions

- The inverted-U hypothesis is flawed.
- 'The real catastrophe would be for sport psychology to remain tied to the inverted-U hypothesis as the only plausible model of the stress-performance relationship'.
- Catastrophe models of motor performance under anxiety can be applied to describe the relative contributions to performance of cognitive anxiety, 'on the day' physiological arousal, task difficulty and self-confidence.
- The inverted-U hypothesis is not the only plausible model of the stress-performance relationship.
- The relationship between stress and performance can be explained through the application of a catastrophe model.

# Mood changes following social dance sessions in people with Parkinson's Disease. Lewis, C., Annett, L., Davenport, S., Hall, A. and Lovatt, P. (2014), *Journal of Health Psychology*, Leeds: The National Coaching Foundation, 19, (4).

## 1. Theory/ies on which the study is based

- Parkinson's disease (PD), a neurodegenerative disease, typically developing in people above the age of 50 years, is associated with the motor signs of tremor, bradykinesia, rigidity and postural instability.
- Although PD is predominantly identified by these motor symptoms, non-motor features are also shown to be associated with the condition, including sleep disturbances (Menza et al., 2010), deficits in tasks of executive functioning (Rodriguez-Ferreiro et al., 2010) and altered mood (Brown et al., 2011).
- 'Depression is the most common neuropsychiatric disturbance in PD' (Papapetropoulos et al., 2006: 465).
- It is thought that early intervention in the treatment of depression in PD could be essential in aiding cognitive function (Kuzis et al., 1997; Starkstein et al., 1990).
- Exercise can have positive benefits on mood in adults who do not have PD (McDonald and Hodgdon, 1991; Smith, 2013), including those with other chronic illnesses (Graham et al., 2008). Conversely, mood can regulate the quality of the exercise performance (Lane et al., 2012).
- Exercise is proposed to be particularly beneficial for anxiety and depression (Steinberg et al., 1998).
- Anxiety and depression are the two most common psychological disorders in PD and the elderly (Carod-Artal et al., 2008).
- Dance classes can potentially be beneficial for well-being and social relationships. However, although dance may increase mood in all individuals, there may be a greater benefit for those with initially low depression scores (Lane and Lovejoy, 1999).
- Dance can help the motor symptoms of PD (Hackney and Earhart, 2009; Hackney et al., 2007).
- Dance may have particular psychological benefits due to the mental challenges that dance steps and timing can provide, such as memory, learning and spatial awareness (Lima and Vieira, 2007).
- Dance is a sociable form of exercise. Lack of sociability is linked to depression in elderly (Anderson, 2001), thus potentially explaining positive benefits of mood from dance.

## Mood changes following social dance sessions in people with Parkinson's Disease. Lewis, C., Annett, L., Davenport, S., Hall, A. and Lovatt, P. (2014), *Journal of Health Psychology*, Leeds: The National Coaching Foundation, 19, (4).

### 2. Background to the study

- Research has consistently shown that there is a high prevalence of depression in people with PD, such that up to 60 per cent of scores in relation to quality of life can be explained by depression (Global Parkinson's Disease Survey (GPDS) Steering Committee, 2002) and perhaps even more than the severity of the motor symptoms of the disease (Suzukamo et al., 2006).
- Starkstein et al. (1992) found that depression in PD was strongly associated with a greater decline in cognition and severity of disease.
- Despite the consistent identification of an association between depression and PD (Brown et al., 2011; Schindler et al., 1993; Tandberg et al., 1996), the implications of mood disturbance are often neglected both by patients and by neurologists failing to identify depression in up to potentially 75 per cent of people with PD (Schindler et al., 1993; Schulman et al., 2002).
- Research has shown that dance can help to regulate mood such that positive mood is increased and negative mood is decreased following dance exercise interventions over short-term, progressive periods of up to 50 minutes (Hansen et al., 2001; Kennedy and Newton, 1997) and over a longer period of 7 weeks (Steinberg et al., 1998). Improvements in mood, including those measured by the Profile of Mood States (POMS) have been observed after just 10 minutes of exercise, including dance, resulting in higher vigour and less confusion (Lane et al., 2003; Maroulakis and Zervas, 1993; Rokka et al., 2010) and an improvement in total mood score, vigour and fatigue (Abrantes et al., 2012; Hansen et al., 2001).
- In a meta-analysis carried out by Goodwin et al. (2008), it was concluded that exercise resulted in improvements to physical functioning, balance, strength and health-related quality of life. Physical benefits in flexibility, balance and coordination were also reported by Alpert et al. (2009) following 15 weeks of jazz dance classes.
- In a qualitative study by Paulson (2011), who interviewed elderly dancers, the main themes to emerge were feelings of psychological well-being, as well as a sense of belonging. Lima and Vieira (2007) followed dance classes over the period of one year in the elderly. Participants reported 'being transported to a world of happiness' and being able to 'forget their problems'.
- Not all studies have shown improvements in mood following dance classes in the elderly (Alpert et al., 2009; Eyigor et al., 2009; McInman and Berger, 1993; Maroulakis and Zervas, 1993), and research focusing on the benefits of dance for PD often fails to assess the potential mood benefits that dance could provide. No research, until this study had been identified that investigated whether dance classes could improve mood in PD over both a short and a longer time period.
- The objective of this study was, therefore, to examine the moderating effect of dance on mood in the elderly and more specifically in a group of people with PD across a long cycle of 12 weeks and a short cycle of one hour.

# Mood changes following social dance sessions in people with Parkinson's Disease. Lewis, C., Annett, L., Davenport, S., Hall, A. and Lovatt, P. (2014), *Journal of Health Psychology*, Leeds: The National Coaching Foundation, 19, (4).

## 3. Research method

- This study formed part of a larger study investigating dance as an intervention for PD.
- The research method was an experiment.
- A mixed design (matched participants and repeated measures) was used with two independent variables:
  - The first independent variable (IV1) was the naturally occurring variable of group – whether participants were sufferers of PD or whether participants did not suffer with PD (the control group). This part of the experiment used a matched participants design.
  - The second independent variable (IV2) which was manipulated by the researchers was the time cycle: Long Cycle Time (week 1 vs. week 12), or Short Cycle Time (before class vs. after class). This part of the experiment used a repeated measures design.
- The dependent variables (DVs) were participants' mood scores.

## 4. Sample

- A total of 37 participants, aged between 50–80 years (M = 65.5 years), took part in the study. Of these, 22 participants (12 males, 10 females) had been diagnosed with PD and were all rated as having mild to moderate PD (Hoehn and Yahr I–III) by trained physiotherapists. The remaining 15 participants (7 males, 8 females) acted as age-matched controls.
- Participants were recruited through local advertisements and through contact with local PD support groups (therefore a self-selecting sample).
- Eight of the controls were partners of those in the PD group.
- Many participants in the control group were carers for the people taking part with PD.
- This study was ethically approved at an institution in the United Kingdom.
- All participants gave informed consent.

# Mood changes following social dance sessions in people with Parkinson's Disease. Lewis, C., Annett, L., Davenport, S., Hall, A. and Lovatt, P. (2014), *Journal of Health Psychology*, Leeds: The National Coaching Foundation, 19, (4).

## 5. Outline of the procedure/study

### Materials

- *POMS*. The POMS (McNair et al., 1971) was used to measure mood changes across long cycle time. The POMS is a 64-item mood scale and is scored on six subcategories: Tension–Anxiety, Vigour–Activity, Depression–Dejection, Fatigue–Inertia, Anger–Hostility and Confusion–Bewilderment. The POMS also produces a Total Mood Disturbance (TMD) score, calculated by adding all responses and subtracting Vigour from the rest of the subscales. Responses to mood are indicated on a 5-point Likert scale (0 = Not at all - to 4 = extremely). Lower scores indicate a more positive mood state in all subscales other than Vigour, where a higher score suggests higher energy and elevated mood.

### Procedure

- Participants were asked to fill out a demographics questionnaire and the POMS according to how they felt in the past month.
- Participants were also administered the Mini Mental State Examination (MMSE) at baseline, in a meeting prior to the first dance class (week 1).
- Participants then attended a weekly dance class, run by a qualified dance instructor, for a period of 10 weeks (weeks 2–11).
- Dance classes lasted for 50 minutes and consisted of a 10 minute warm-up, 30 minutes of dancing and ended with a 5 minute cool-down. A 5-minute break was given midway. Each class was based on rhythmic dancing to a strong beat, designed to be appropriate for the age, mobility and constraints of people with mild to moderate PD. They completed the classes standing, with the option to sit down if desired. The style of dancing changed every 2 weeks and consisted of Bollywood, Tango, Cheerleading, Old Time Music Hall and Party dancing based on the Charleston and Saturday Night Fever.
- Participants were taught in two separate, yet identical, dance classes.
- In the ninth week, participants were asked to complete the BRUMS, according to how they felt 'right now', before and after the dance class (short cycle).
- Following completion of the dance classes, participants were asked to complete the POMS for a second time a few days later in week 12 (long cycle).

# Mood changes following social dance sessions in people with Parkinson's Disease. Lewis, C., Annett, L., Davenport, S., Hall, A. and Lovatt, P. (2014), *Journal of Health Psychology*, Leeds: The National Coaching Foundation, 19, (4).

## 6. Key findings

N.B. Two participants (Parkinson's = 1, Control = 1) dropped out of the study during the intervention due to an unrelated medical issue and because they did not wish to continue, respectively. Five participants (Parkinson's = 3, Control = 2) were unable to attend the final testing session due to either a holiday ( $n = 2$ ), other commitments ( $n = 2$ ) or illness ( $n = 1$ ) and therefore failed to submit final POMS questionnaires. One further person from the control group was excluded due to scoring below the cut-off point on the MMSE.

- Comparisons using independent samples t-tests between mean scores of the PD and control groups revealed no significant differences between the two groups for age, MMSE scores or baseline mood scores ( $p > 0.05$  in all cases).
- One sample t-tests were carried out comparing normative to baseline POMS scores for PD and control participants. Tension, Vigour, Confusion and TMD were found to be significantly different from the norms in the PD group, in all cases showing a higher mood disturbance to the norms. No significant differences ( $p > 0.05$ ) from the norms were found for the control group.

- Long cycle time:

- TMD data for long cycle time was subjected to a  $2 \times 2$  mixed analysis of variance (ANOVA): Factor 1 – Group (PD vs. Control); Factor 2 – Time (pre- and post intervention).
- TMD scores showed a significant main effect of time,  $F(1, 26) = 5.75, p = 0.024$ ; such that total disturbance in mood was lower post intervention. There was no significant main effect of group and no interaction between time and group ( $p > 0.05$ ).

In order to determine whether the change in overall mood was due to a particular subscale, a  $2 \times 2$  multivariate analysis of variance (MANOVA) was conducted, where each subscale served as a DV. Data of one participant were automatically excluded from the MANOVA, due to two incomplete subscales.

- A mixed MANOVA showed no significant differences between group and time on the combined DVs ( $p > 0.05$ ). The interaction between time and group, however, reached borderline significance,  $F(6, 21) = 2.57, p = 0.05$ .
- When the results for the DVs were considered separately, a significant difference for time was found in Tension,  $F(1, 26) = 4.76, p = 0.038$ ; Anger,  $F(1, 26) = 9.6, p = 0.005$ ; and Vigour approached significance,  $F(1, 26) = 3.56, p = 0.072$ , such that all participants reported less tension and anger and greater vigour. Using a Bonferroni-adjusted  $p$ -value of 0.008 (to allow for the chance of a type I error occurring due to multiple testing and correlated DVs), Anger was the only subscale to remain significant.
- There were no significant differences for group ( $p > 0.05$  in all cases). The only subscale to show a significant interaction between time and group was Anger,  $F(1, 26) = 7.53, p = 0.011$ .

# Mood changes following social dance sessions in people with Parkinson's Disease. Lewis, C., Annett, L., Davenport, S., Hall, A. and Lovatt, P. (2014), *Journal of Health Psychology*, Leeds: The National Coaching Foundation, 19, (4).

## 6. Key findings . . . continued

- Further analyses comparing improvements in mood to initial POMS depression scores were carried out.
  - A  $2 \times 2$  mixed MANOVA – Factor 1: Depression group (low vs. high); Factor 2 – Time (pre- and post intervention) – revealed a significant main effect of group,  $F(6, 21) = 17.92, p < 0.001$ , but no significant main effect of time and no interaction ( $p > 0.05$  in all cases) on the combined DVs.
  - When the analysis for DVs was carried out separately, main effects of time were found for Tension,  $F(1, 26) = 7.14, p = 0.013$ ; and Anger  $F(1, 26) = 5.1, p = 0.033$ ; such that lower feelings of tension and anger were present post intervention. Fatigue also showed a significant effect of time,  $F(1, 26) = 5.55, p = .026$ ; such that lower levels of fatigue were reported post intervention. Using a Bonferroni-adjusted  $p$ -value of 0.01, Tension reached borderline significance. However, Anger and Fatigue were no longer significant.
  - There were significant main effects of depression for all POMS subscales ( $p < 0.01$  in all cases) such that higher levels of mood disturbance were present in the depressed group. Fatigue was the only subscale to show a significant interaction between time and group,  $F(1, 26) = 5.62, p = 0.025$ .

Participants in the higher depression group reported less fatigue after the dance intervention in comparison to before, while people with lower depression remained equal in levels of fatigue. Initial levels of fatigue, however, were higher in those reporting higher levels of depression, confirmed by an independent samples t-test,  $t(17.74) = -5.94, p < 0.001$ .

### Short cycle time

Due to varying sample sizes across POMS subscales, short cycle time was subjected to mixed ANOVAs – Factor 1: Group (PD vs. Control); Factor 2: Time (at pre and post intervention).

- TMD scores showed a significant effect of time,  $F(1, 19) = 5.26, p = 0.033$ ; such that TMD scores improved over time. There was no significant effect of group and no interaction between time and group ( $p > 0.05$ ).
- Mixed ANOVAs on BRUMS short cycle scores showed a significant main effect of time for Tension,  $F(1, 24) = 4.47, p = 0.045$ ; and Vigour,  $F(1, 22) = 6.75, p = 0.016$ . Depression scores of time approached significance,  $F(1, 24) = 3.9, p = 0.06$ . In all cases, there was no significant main effect of group and no interaction between time and group ( $p > 0.05$ ). All participants showed positive improvements in feelings of tension, vigour and depression. However, when a Bonferroni adjustment with a  $p$ -value of 0.008 was used, no significant effects remained, suggesting that there were no improvements in the short cycle time.
- Further analyses taking depression levels into account revealed no further significant effects.

# Mood changes following social dance sessions in people with Parkinson's Disease. Lewis, C., Annett, L., Davenport, S., Hall, A. and Lovatt, P. (2014), *Journal of Health Psychology*, Leeds: The National Coaching Foundation, 19, (4).

## 6. Key findings . . . continued

### Summary

- Results showed that specific mood changes occurred in elderly people with and without PD over short and long cycle time. Participants' overall mood disturbance was significantly reduced, as measured by the POMS. Further analysis revealed that anger in particular was significantly reduced over a period of 12 weeks. Further analysis on POMS scores revealed that people with higher depression reported less fatigue following the dance classes. A reduction in TMD was also observed over a short cycle time, pre and posts one dance class, as measured by BRUMS.
- There were no differences between the PD and Control participants in baseline scores of either long cycle time or short cycle time on the POMS and BRUMS subscales in relation to depression, fatigue and anxiety. (Those people with higher depression scores may be less likely to volunteer due to the self-selecting sample employed).
- Differences were observed, however, between baseline POMS scores of PD and geriatric nor-mative data for the POMS in the subscales Tension, Vigour, Confusion and TMD such that those with PD showed a higher mood disturbance score throughout.

## 7. Possible conclusions

### Summary

- Dance interventions have physical benefits for the elderly, especially those with PD.
- Dance can provide psychological benefits for both people with PD and the elderly.
- Dance can provide positive benefits over both a long and a short cycle time for the elderly, including those with PD.
- Dance can help improve mood states in elderly people, especially those suffering with Parkinson's disease.
- Dance can help reduce anger in elderly people, especially those suffering with PD.
- Exercise, including dance aerobics, can improve levels of vigour, TMD and fatigue..

# Playing with confidence: the relationship between imagery use and self-confidence and self-efficacy in youth soccer players. Monroe-Chandler, K., Hall, C. and Fishburne, G. (2008), *Journal of Sports Science*, 26, (14), 1539–1546.

## 1. Theories on which the study is based

- Imagery is one way to enhance confidence (Bandura, 1997).
- Imagery is defined as an “experience that mimics real experiences. It differs from dreams in that we are awake and conscious when we form an image” (White and Hardy, 1998).
- Athletes can benefit from using imagery in sport to enhance performance (Morris, Spittle, and Watt, 2005).
- Imagery – in sport - has both cognitive and motivational functions that operate on either a specific or a general level. Thus, the cognitive general (CG) function entails imaging strategies, game plans or routines (e.g. a two on one in soccer), whereas the cognitive specific (CS) function involves imaging specific sport skills (e.g. taking a free kick). The motivational general (MG) function of imagery includes imaging physiological arousal levels and emotions (e.g. getting psyched up before a game); and the motivational specific (MS) function of imagery includes imaging individual goals (e.g. standing on the podium) – Paivio’s analytic framework.
- Paivio’s conceptual framework has since been amended, with the MG function of imagery divided into two lower-order functions: motivational general arousal (MG-A) imagery, which comprises images surrounding affect regulation (e.g. remaining calm in front of a large crowd); and Motivational General Mastery (MG-M) imagery, consisting of images related to mastery, self-confidence and mental toughness (e.g. being able to overcome adversity) (Hall, Mack, Paivio, and Hausenblas, 1998).
- Using the five functions of imagery, Martin et al. (1999) developed an Applied Model of Imagery which suggests that the type (or function) of imagery use influences the cognitive, affective and behavioural outcomes and these relationships are moderated by imagery ability. The model outlines two important sport-related cognitions that may be affected by imagery use; namely, self-confidence and self-efficacy. Martin et al. argued that although imagery can serve multiple functions (e.g. rehearsing skills and strategies, regulating arousal and anxiety), the function of imagery employed should match the intended outcome. That is, if an athlete is interested in increasing self-confidence or self-efficacy, MG-M should be the function of imagery implemented given it is most relevant for increasing, maintaining or regaining confidence.
- In sport, there are two main approaches to the study of confidence; self-confidence and self-efficacy.
- Self-confidence is a general term which is most often measured as trait sport confidence. It refers to an athlete’s certainty about his or her ability to be successful in sport (Vealey, 1986).
- Self-efficacy refers to one’s belief that s/he can be successful in specific tasks, skills or under specific conditions (Bandura, 1986).
- There are four sources of self-efficacy: performance accomplishments (mastery), vicarious learning (e.g. imagery), verbal persuasion and physiological states (Bandura, 1986).
- Confidence is one of the most consistent factors in distinguishing successful from non-successful athletes (Gould, Weiss, and Weinberg, 1981).
- Imagery is one way to enhance self-confidence and self-efficacy (Bandura, 1977).
- When it comes to sport confidence, the imaged rehearsal of specific sport skills may not be as important as the imagery of sport-related mastery experiences (Morris et al., 1996).

# Playing with confidence: the relationship between imagery use and self-confidence and self-efficacy in youth soccer players. Monroe-Chandler, K., Hall, C. and Fishburne, G. (2008), *Journal of Sports Science*, 26, (14), 1539–1546.

## 2. Background to the study

- Recent qualitative research conducted by Munroe-Chandler, Hall, Fishburne, and Strachan (2007) and Munroe-Chandler, Hall, Fishburne, O, and Hall (2007) demonstrated that young athletes of 7– 14 years reported using imagery and that developmental differences existed. More specifically, athletes of from all age cohorts reported using imagery for both cognitive and motivational purposes. However, younger athletes used imagery related to individual goals, whereas older athletes used imagery related to team goals. Additionally, the 11–14-year-old athletes reported using imagery more than their younger counterparts (7–10 years).
- Most of the sport research on the sources of confidence has followed Bandura's (1986) self-efficacy theory and has shown support for Bandura's four sources of self-efficacy. However, more recent research has actually questioned whether those sources identified by Bandura were salient to athletes within a sport context (Vealey, Hayashi, Garner-Holman, and Giacobbi, 1998) Through a series of studies these researchers identified nine sources of self-confidence that would be practically organised into three broad domains; achievement, self-regulation and climate.
- Research specifically examining MG-M imagery supports Bandura's (1997) proposal that imagery is one way to enhance self-confidence and self-efficacy. For example, Callow, Hardy, and Hall (2001) examined the effects of MG-M imagery on the confidence of elite adult badminton players. The results showed that a 20- week imagery intervention improved the sport confidence for two of the players and stabilised the sport confidence of the third player. Mills, Munroe, and Hall (2001) examined imagery use and a specific form of self-confidence, namely self-efficacy in adult individual sport athletes. Results revealed that athletes who were high in self-efficacy in competition situations tended to use more MG-M imagery than their low self-efficacy counterparts.
- Vadocz, Hall, and Moritz (1997) investigated the relationships between imagery use and anxiety and self-confidence in elite roller skaters between the ages of 12 and 18 years (Mean age = 15.39). It was found that motivational imagery use was related to both competitive state anxiety and self-confidence, and more specific to the present discussion athletes who used more MG-M imagery were more confident. Using the same sample of athletes as Vadocz et al. (1997) but a different measure of confidence, Moritz, Hall, Martin, and Vadocz (1996) also demonstrated that high-sport confident athletes use more MG-M imagery than those athletes having lower sport confidence.
- Hall (2001) and Gregg and Hall (2006) found that higher skilled athletes employ more imagery than lower skilled athletes.
- Although there seems to be considerable evidence that the use of MG-M imagery is associated with increased self-confidence and self-efficacy, the research has been conducted with relatively elite athletes who are adolescents or adults the question remains: Does this relationship hold for recreational athletes and younger athletes?
- The purpose of the present study was to examine the relationship between imagery use and confidence (self-confidence and self-efficacy) in soccer (football) players aged 11-14 years competing at both the recreational and competitive levels.
- The researchers had two hypotheses:
  - (i) MG-M imagery will be a significant predictor of both self-confidence and self-efficacy in young athletes (a non-directional hypothesis).
  - (ii) The relationship between MG-M imagery use and self-confidence and self-efficacy will be stronger in competitive athletes than recreational athletes (because self-confidence and self-efficacy are important to success in competitive sport). (A directional hypothesis).

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## 3. Research method

- This study used the self-report research method to gather data in relation to young soccer players' use of imagery (using the SIQ-2C), their general self-confidence (using the CTAI-2C) and their self-efficacy in soccer (using the SEQ-S).
- Data were collected mid-soccer season over the course of a two week period.
- Correlation was used to analyse the data gathered (so cause and effect could not be determined).

## 4. Sample

N.B. The sport of soccer was targeted because it has two clearly defined levels, house league (i.e. non-elite) and travel (i.e. elite), and is equally represented by both males and females (Canadian Soccer Association). Soccer is the largest youth participation sport in Canada with over 702,000 youths (under 18 years old) registered in 2004 (Canadian Soccer Association).

- A sample of young athletes was recruited from house and travel soccer leagues from south-western Ontario.
- The sample consisted of 125 participants (56 male, 69 female) all of whom were soccer athletes with ages 11–14 years.
- The total sample of athletes reported a mean of 6.11 years of soccer playing experience.
- The participants competed in both house/recreation (n = 72) and travel/competitive (n = 50) levels.

(The focus of recreational soccer is on skill development, and although recreational athletes do not have a tournament at the end of season to determine a league winner, they do partake in game play against other teams within their league. Competitive level athletes, on the other hand, play games against opposing leagues as well as teams within their own league and compete in tournament play to determine a league winner.)

- Three participants did not report their level and as such were removed from any further analysis resulting in a total sample of 122 athletes.

## 5. Outline of the procedure/study

### Measures

- *Imagery use* was measured using the Sport Imagery Questionnaire for Children (SIQ-C). The SIQ –C is a 21-item questionnaire with statements measuring the frequency of children's imagery use. Statements were scored from 1 (not at all) to 5 (very often) and participants were asked to circle the number that most applied to that particular statement. Each of the five functions of imagery was assessed throughout the 21 items e.g.
  - 'I can usually control how a skill looks in my head' – addressed the CS function of imagery.
  - 'I make up new game plans, or routines in my head' – addressed CG imagery.
  - 'I see myself being mentally strong' addressed MG-M imagery.
  - 'In my head, I imagine how calm I feel before I compete' addressed the MG-A imagery function.
  - 'I see myself doing my very best' addressed MS imagery.

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## 5. Outline of the procedure/study

- *Confidence* was measured using the Competitive State Anxiety Inventory – 2 for Children (CSAI-2C) – moderated for this study to the Competitive Trait Anxiety Inventory – 2 for Children (CTAI-2C) as the study was concerned with the athletes' trait measures of confidence. It is a 15-item questionnaire that measures somatic and cognitive anxiety as well as confidence. As this study was only interested in the confidence subscale, the anxiety subscales were not employed. The confidence subscale consists of five items that are rated on a 4-point Likert scale from 1 (not at all) to 4 (very much so).
- *Self-efficacy* was measured using the Self-efficacy Questionnaire for Soccer (SEQ-S). It is a 5-item questionnaire which asks participants to record the strength of their belief in their mental abilities (e.g. focused, in control, mentally tough) based on a 100-point scale, ranging in 10-unit intervals from 0 (No Confidence) to 100 (Complete Confidence). The five items were:
  - (i) 'I am confident I can work through difficult situations'.
  - (ii) 'I am confident I can remain focused during a challenging situation'.
  - (iii) 'I am confident I can be mentally tough throughout a competition'.
  - (iv) 'I am confident I can remain in control in challenging situations'.
  - (v) 'I am confident I can appear confident in front of others'.

## Procedure

- After receiving clearance from the university's research ethics board (University of Windsor, Windsor, Ontario, Canada), the soccer teams were contacted by the researchers through email and mailed letters to the coach.
- Parental consent and player assent were also obtained. The players first were asked to complete a general demographics questionnaire including their age, gender, level and number of years playing soccer.
- Next, the participants completed the three questionnaires in the following order; the SIQ-C to assess their frequency of imagery use, the CTAI-2C to measure their generalised confidence, and finally the SEQ-S to assess their self-efficacy in soccer.
- Completion of the questionnaires took approximately 15 minutes.
- They were completed prior to the athletes' practice at their respective practice fields.
- Data were collected mid-soccer season over the course of a two week period.

# Playing with confidence: the relationship between imagery use and self-confidence and self-efficacy in youth soccer players. Monroe-Chandler, K., Hall, C. and Fishburne, G. (2008), *Journal of Sports Science*, 26, (14), 1539–1546.

## 6. Key findings

- No significant differences were found between level of play (competitive and recreational) or gender (male and females) with respect to any of the dependent variables (five imagery functions, self-confidence, or self-efficacy) or the number of years playing.
- To make comparisons between scores on imagery frequency (SIQ-C) and confidence (CTAI-2C) and self-efficacy (SEQ-S), Pearson correlations were calculated. Analyses showed:
  - (i) All the correlations between the imagery subscales and the two confidence measures were positive and significant and ranged from moderate to strong
  - (ii) The MG-M subscale of the SIQ-C was most strongly correlated with SEQ-S and CTAI-2C (as expected).
  - (iii) The two measures of confidence, SEQ-S and CTAI-2C, were significantly correlated.
- To examine the relationship between imagery use and self-confidence and self-efficacy in athletes, a series of regressions were run. Separate analyses were run for the recreational and competitive groups.
- In relation to the CTAI-2C: The results for the recreational group revealed that the overall regression for self-confidence was significant ( $p < 0.001$ ). MG-M (Motivational General Mastery imagery) accounted for 50.6% of the total variance. Moreover, MG-A (Motivation-General Arousal imagery) and MS (Motivational Specific imagery) significantly accounted for an additional 12.7%. The results for the competitive group revealed that the overall regression for self-confidence was significant ( $p < 0.001$ ). MG-M, which was the only significant predictor, accounted for 39.6% of the total variance. It was also found that the use of MG-M was positively related to self-confidence ( $p < 0.01$ ).
- In relation to the SEQ-S: The results for the recreational group showed that the overall regression for self-efficacy was significant ( $p < 0.001$ ). MG-M was the only significant predictor accounting for 51.6% of the variance. MG-M was positively related self-efficacy ( $p < 0.01$ ). The results for the competitive group showed that the overall regression was also significant ( $p < 0.001$ ). MG-M was the only significant predictor accounting for 57% of the variance. MG-M was also positively related self-efficacy ( $p < 0.01$ ).

### To summarise

- As was hypothesised, MG-M imagery proved to be a significant predictor of self-confidence and self-efficacy in young soccer players. More specifically, MG-M imagery accounted for between 40 and 57% of the variance for both self-confidence and self-efficacy with MG-A and MS only adding marginally to the prediction of self-confidence in recreational athletes.
- The relationship between MG-M imagery use and self-confidence and self-efficacy was not significantly different between the two groups.

## Playing with confidence: the relationship between imagery use and self-confidence and self-efficacy in youth soccer players. Monroe-Chandler, K., Hall, C. and Fishburne, G. (2008), *Journal of Sports Science*, 26, (14), 1539–1546.

### 7. Possible conclusions

- MG-M (Motivational General Mastery) imagery is a significant predictor of self-confidence and self-efficacy in young soccer players.
- If a youth athlete, regardless of competitive level, wants to increase his/her self-confidence or self-efficacy through the use of imagery, the MG-M function should be emphasised.
- MG-A (Motivation-General Arousal) and MS (Motivational Specific) imagery contribute to the prediction of self-confidence in recreational athletes.
- The relationship between MG-M imagery and self-confidence and self-efficacy does not differ greatly between recreational and competitive soccer players. / Competitive level has no influence on the relationship between MG-M imagery and self-confidence and self-efficacy.
- It is important to match the function of imagery use (MG-M) with the intended outcome (self-confidence or self-efficacy).
- Encouraging young athletes to use more MG-M imagery is one very important avenue for enhancing their self-confidence and self-efficacy.

# Multivariate personality profile analysis of four athletic groups.

Kroll, W. and Crenshaw, W. (1970), *Contemporary psychology of sport*, 97–106.

## 1. Theory/ies on which the study is based

- Personality is an important factor in successful sports performance.
- Certain personality characteristics are (a) prerequisites for success and (b) necessarily different for different athletic activities.
- Certain personality characteristics can be linked for entering, continuing with, or dropping out of participation in sport.
- Certain personality characteristics can be affected by participation and associated experiences dependent upon features found both in the participant and in the specific sport.

## 2. Background to the study

- Coupled with rather inadequate statistical analysis, little has been contributed to the formulation of any general principles of personality factors in athletics. However, since 1950, steady progress has been made in the clarification of major personality theories, in particular in relation to the development of instruments for personality assessment.
- One problem with studies relating to personality and sport has been the lack of suitably defined criterion samples which are truly representative of the sports being investigated. Information concerning the quality of sport participants being investigated is quite scarce.
- Previous research had shown no differences in personality profiles within wrestlers of different quality levels of skill (Kroll, 1967) or for karate participants (Kroll and Carlson, 1967).
- Research by Kroll, 1967; Kroll and Carlson, 1967; Kroll and Peterson, 1965, have analysed personality profiles of participants with known quality levels of athletic achievement from samples which represented more than a particular local situation. This in-sport analysis provided pertinent and essential information in relation to within-sport personality composition.
- The purpose of this study was to build on the previous research into within-sport personality composition by making an overall between sport analysis.

## 3. Research method

- This study used the self-report research method to gather data in relation to athletes' personality characteristics
- The self-report method used was the Cattell Sixteen Personality Factor Questionnaire (16 PF Test).

# Multivariate personality profile analysis of four athletic groups.

Kroll, W. and Crenshaw, W. (1970), *Contemporary psychology of sport*, 97–106.

## 4. Sample

- A total of 387 athletes were included in the analysis:
  - 81 were football players (from five collegiate teams representing both winning and losing teams from several categories of colleges in the middle geographic section of the USA)
  - 141 were gymnasts from 14 college and university teams representing a national cross-section of the USA.
  - 94 were wrestlers representing (i) a superior group of Olympic team and national tournament place winners, (ii) an excellent group of varsity representatives rated excellent by their coach and who had won 60% or more of their matches during the season, (iii) an average to below-average group of four college teams
  - 71 were amateur karate participants from five teams over a four state area of the south-western USA.
- They were all therefore of regional or national level.

## 5. Outline of the procedure/study

- Form A of the Cattell Sixteen Personality Factor Questionnaire (16 PF Test) was administered to 139 football players, 141 gymnasts, 96 wrestlers, and 71 karate participants.
- In addition, several other tests were administered, one of which contained the 15-item lie scale of the MMPI. Any subject who scored seven or above on the lie scale was deleted from the study since the validity of his test responses could be questioned. (This accounts for the difference in the total number of athletes who were asked to complete the 16PF Test and the number of athletes who were included in the analysis.)
- The analysis technique utilised was the multiple discriminant function (Cooley and Lohnes, 1962) to determine whether group of subjects could be distinguished from each other on the basis of the entire personality profile rather than by analysis of each profile component separately.

# Multivariate personality profile analysis of four athletic groups.

Kroll, W. and Crenshaw, W. (1970), *Contemporary psychology of sport*, 97–106.

## 6. Key findings

- Significant differences between groups on personality profiles were shown to exist.
- The six major contributors to the first discriminant factor were found to be (i) shy vs. venturesome, (ii) group-dependent vs. self-sufficient, (iii) trusting vs. suspicious, (iv) less intelligent vs. more intelligent, (v) reserved vs. outgoing, (vi) affected by feelings vs. emotionally stable.
- Results from the multiple discriminant function analysis were used with a method of maximum likelihood classification for purposes of testing each individual score vector for group membership. The rule followed was to assign an individual to a the group for which the probability of group membership was highest.
- Of the 81 members of the football group, 32 of these were predicted to be in the football group, 18 in wrestling, 9 in karate and 22 in gymnastics.
  - All correct classifications appear in the diagonal i.e. probability of group membership was highest for the group of actual membership.
  - Out of an N of 387, correct classifications were made for a success of 50.6%.
  - Gymnasts were classified correctly 73.1% of the time.
  - Football players, wrestlers and karate participants were classified with similar success rates: 39.5%, 39.4% and 33.8% respectively.
- To explore the results further, discriminant function analyses were made for each of the possible pairings of sports groups.
- By making comparisons in pairs of groups the role of the major contributors to the discriminant function on all four groups is made clearer.
- Significant discriminant functions were shown for all contrasts between sport groups except Football and Wrestling.
- Gymnasts scored lowest of all four groups on the relaxed vs. tense factors whilst karate participants scored the highest.
- Gymnasts scored lowest and karate participants highest on the non-conforming vs. conforming factor.
- Gymnasts scored the lowest on the sober vs. happy-go-lucky factor, denoting a silent, introspective demeanour but highest on the intelligence factor.
- The group-dependent vs. self-sufficient factor was a major contributor to the overall four-group discriminant analysis. Whenever wrestlers or footballers were contrasted against the other groups this factor was a significant contributor to the discriminant factor ( $p = 0.01$ ). No other factor was shown to be such a common discriminator.
- Footballers and wrestlers scored highest on group dependence. The result for wrestlers went against the overall trend that those participating in team sports scored higher in group dependence than those playing individual sports.

## 7. Possible conclusions

- Sports people exhibit different personality characteristics.
- Football players and wrestlers exhibit 16PF profiles that are homogeneous.
- Football players and wrestlers exhibit 16PF profiles that differ from those exhibited by gymnasts and karate participants.
- Gymnasts and karate participants exhibit different personality profiles.
- The sports of football and wrestling (in the USA) share many similar personality characteristics.

# Coach effectiveness training: a cognitive-behavioral approach to enhancing relationship skills in youth sports coaches. Smith, R. E., Smoll, F. L. and Curtis, B. (1979), *Journal of Sport Psychology*, 1, (1), 59–75.

## 1. Theory/ies on which the study is based

- The results of organised athletic experiences on psychosocial development are variable (Ash, 1978; Rarick, 1969) and depend on numerous factors, including the structure and supervision of the programme.
- The 'athletic triangle' consists of: the child, parent and coach.
- Good quality supervision is vital in youth sports. – see the *Official Rules* (1977) of the Little League Baseball page 18.
- Sport psychologists can make significant contributions to youth sports, especially in the promotion of the psychological welfare of those involved.
- Assessment, programme evaluation and behaviour change skills are particularly relevant to the development of research programmes and application (Smith and Smoll, 1978).
- The development of cognitive and behaviour change methods are highly applicable to intervention programmes designed to modify coaching attitudes, goals and behaviours in desirable ways.
- Cognitive-behavioural frameworks can be used to make coaches more aware of their behaviours, to create expectancies concerning the likely consequences of various coaching behaviours, to increase their desire to generate certain consequences rather than others, and to develop or enhance their ability to perform desirable behaviours effectively.
- The concurrent use of a variety of techniques can be effective for behavioural change in a variety of intervention contexts (e.g. Edelstein and Eisler, 1976; Gottman and McFall, 1972).

## 2. Background to the study

- The past 50+ years has witnessed the development of increasingly organised youth sport games. More formalised programmes now exist and youth sports have come to involve a broadening range of community participation. It was estimated that as many as 17 million children were involved in organised sport programmes in the late 1970s. (Martens, 1978).
- The social system of youth sports has become increasingly complex with increased involvement of parents and other adults.
- Youth sports will continue to grow and a concern now is how to increase the likelihood that the children involved will receive a positive outcome from participation. It seems that the most direct path to achieving this goal is to concentrate on the point in the 'athletic triangle' that is most likely to have an immediate positive impact, namely the coach or adult supervisor.
- The behavioural guidelines communicated to coaches in the training programme used in this study were empirically derived from a preliminary investigation involving 51 Little League coaches and 542 of their players (Smith, Smoll and Curtis, 1978). In this study, a behavioural assessment system was used to categorise the behaviours of the coaches during an average of nearly four complete games. At the conclusion of the season, the children were interviewed individually, in their homes to obtain measures of the perception and recall of their coaches' behaviours and of their evaluative reactions to the coach, team-mates, and other aspects of their athletic experience. On the basis of empirical relationships between observed coaching behaviours, players' perceptions and recall of such behaviours, and players' attitudes, a series of behavioural guidelines were developed (Smoll, Smith and Curtis, 1977).

# Coach effectiveness training: a cognitive-behavioral approach to enhancing relationship skills in youth sports coaches. Smith, R. E., Smoll, F. L. and Curtis, B. (1979), *Journal of Sport Psychology*, 1, (1), 59–75.

## 2. Background to the study . . . continued

- Smith, Smoll and Curtis (1978) found that children with low general self-esteem were responsive to differences in coaching behaviours in terms of their attitudes towards their coaches.
- Previous research by Smith et al., 1978 showed that children who played for highly reinforcing and encouraging coaches had significantly higher levels of post season self-esteem than those who were exposed to coaches who did not behave in this manner.
- This study attempted to transmit and assess the guidelines to coaches and to promote their utilisation with the aim of enhancing the ability of Little League Baseball coaches to relate more effectively with their players.
- It was expected that cognitive changes would promote and mediate positive changes in overt coaching behaviours. The effects of the training programme on coach behaviours and player perceptions, attitudes, and self-esteem were therefore assessed.
- The role of self-esteem as a moderator variable affecting children's reactions to trained and untrained coaches was also investigated with the following hypothesis: Differences in attitudes towards trained and untrained coaches will be most pronounced for low self-esteem children.

## 3. Research method

- This study was a field experiment, as the IV was manipulated and it took place in the real world.
- The independent variable (IV) was whether the coach was assigned to the group who underwent the evening training session or whether the coach was assigned to the no-treatment (control) group.
- The dependent variables (DVs) were the observed behaviours of the coaches during games, players' perceptions of the coaches' behaviours and, player attitudes towards themselves, the coaches, team-mates and the sport.
- Data was gathered through observation (leading to the completion of the CBAS) and self-reports (via the self-monitoring forms, post season interviews and the Self-Esteem Inventory).

## 4. Sample

- The initial sample consisted of 34 Seattle-area, male, Little League Baseball coaches.
- All of the coaches were involved at the major (10-12-year-olds) and senior (13-15-year-olds) levels of the programme.
- They coached in three leagues that had participated in the earlier investigation of relationships between coaching behaviours and players' reactions to the Little League experiences.
- 18 coaches were randomly assigned to the experimental group and 16 were assigned to a no-treatment, control condition.
- The unequal group sizes allowed for a sufficiently large experimental group in case of no-shows for the training programme.
- Three coaches in the control condition were lost during the course of the season due to team mergers or changes in residence.
- The final sample therefore consisted of 18 coaches in the experimental group and 13 coached in the no-treatment, control group. The mean age of these coaches was 36.10 years (SD = 9.99). They had an average of 8.37 years of coaching experience (SD = 6.11).
- In addition, a total of 325 male players (82% of those who played for the experimental and control coaches) were individually interviewed to gather data about their perceptions of the coaches' behaviours and their attitudes towards themselves, the coaches, team-mates and the sport.

# Coach effectiveness training: a cognitive-behavioral approach to enhancing relationship skills in youth sports coaches. Smith, R. E., Smoll, F. L. and Curtis, B. (1979), *Journal of Sport Psychology*, 1, (1), 59–75.

## 5. Outline of the procedure/study

- The training package involved a number of techniques. As well as verbal and written presentation of the devised behavioural guidelines, modelling, behavioural feedback and self-monitoring were employed.

### Training procedures

- Coaches in the experimental group were contacted by telephone and invited to participate in an evening training session. They were told that the results of the previous study conducted within their leagues would be described and guidelines would be presented and discussed.
- The training session lasted about 2 hours and was conducted by the researchers (Smith, Smoll and Curtis).
- Having been informed of the findings of the previous research, the coaches were presented, both verbally and in written form, with the guidelines that had been devised in relation to coaching behaviours. In general the guidelines stressed the desirability of reinforcement, encouragement, and technical instruction designed to elicit and strengthen desirable behaviours. The explicit goals of the guidelines were to increase positive interactions between coaches and players, as well as team-mates, and to reduce fear of failure among players. The following is one excerpt from the written guidelines given to the coaches:

*Good plays:*

*DO – REWARD! Do so immediately. Let the players know that you appreciate and value their efforts. Reward effort as much as you do results. Look for positive things, reward them, and you'll see them increase. Remember, whether the kids show it or not, the positive things you say and do stick with them.*

*DON'T – Take their efforts for granted.*

- The verbal presentation was supplemented by the modelling by the experimenters of both desirable and undesirable methods of responding to specific situations (e.g. player mistakes).
- In addition to the guidelines, coaches were also given a written brochure which contained concrete suggestions for communicating effectively with players, gaining their respect, and relating to parents.
- The importance of sensitivity and being responsive to individual differences among players were also stressed.
- In addition to the information-modelling portion of the training programme, behavioural feedback and self-monitoring procedures were employed to increase self-awareness and to encourage compliance with the coaching guidelines.
  - Behavioural feedback was given through the use of the 12-category the Coaching Behaviour Assessment System (CBAS) (Smith, Smoll and Hunt, 1977a). The coaches were observed during the first 2 weeks of the season by trained coders and were then mailed behavioural profiles reflecting their behavioural patterns during two complete games.
  - Self-monitoring was effected by the coaches completing a brief self-monitoring form immediately after each of their first 10 games of the season. Self-monitoring was restricted to desired behaviours recommended in the guidelines. Completed forms were returned in stamped envelopes provided by the experimenters. Coaches were contacted periodically to remind them to complete and return the forms. All of the coaches returned their completed forms.

# Coach effectiveness training: a cognitive-behavioral approach to enhancing relationship skills in youth sports coaches. Smith, R. E., Smoll, F. L. and Curtis, B. (1979), *Journal of Sport Psychology*, 1, (1), 59–75.

## 5. Outline of the procedure/study . . . continued

### Evaluation procedures

- In order to assess the effects of the training programme on coaches and their players, the experimental and control coaches were compared in terms of observed behaviours during games, players' perceptions of the behaviours and, player attitudes towards themselves, the coaches, team-mates and the sport.
  - Observed behaviours were recorded through the CBAS. The observations were done by 16 undergraduates who were trained over a 4 week period.
  - Player perceptions and attitudes were recorded and assessed through the use of a structured interview conducted at the end of the season. Players were individually interviewed in their own homes by trained interviewers who were blind to whether the players had been coached by coaches in the experimental or control group. Children and their parents were assured their data were confidential and that coaches would be given no information about the data obtained from their teams.

The measure of the players' perception of the coaches' behaviour was presented as a recall test. The player was given a description and examples of each of the 12 CBAS behaviours and asked to indicate on a 7-point scale ranging from 'never' to 'almost always', how frequently his coach had engaged in that behaviour in situations like those described.

Following the recall section of the interview, the boys indicated reactions to their participation and ability-related perceptions. This was done by giving the child a clipboard and asking them to record their own responses on a series of 7-point scales in such a way that the interviewer could not see them. Two examples of the questions asked are: 'How much do you like playing baseball?'; 'How good a baseball teacher is your coach?' The scales ranged, for example, from 'dislike a lot' to 'like a lot' / 'very poor' to 'excellent'.

Assessment of self-esteem: As part of the post season interview, players were asked to complete an adaptation of Coopermith's (1967) Self-Esteem Inventory as a measure of general (global) self-esteem. This consisted of 14 descriptive statements, each of which was rated on a 5-point scale ranging from 'not at all' to very 'much like me'.

## 6. Key findings

### Comparability of experimental and control coaches

- No significant differences were found between the groups of coaches in terms of age, number of years of total coaching experience, and number of years coaching baseball.
- On other behavioural measures, the two groups were also deemed quite comparable.

# Coach effectiveness training: a cognitive-behavioral approach to enhancing relationship skills in youth sports coaches. Smith, R. E., Smoll, F. L. and Curtis, B. (1979), *Journal of Sport Psychology*, 1, (1), 59–75.

## 6. Key findings . . . continued

Observed CBAS behaviour differences

- A total of 26,412 behaviours were coded during four game observations of the experimental and control coaches. Each coach averaged 213.19 codable behaviours per game. The frequency data within the CBAS categories were converted to rate scores and it was found that the rate scores between the two groups did not differ significantly on either any of the 12 behaviour categories or the total of the combined categories.
- Because the two groups did not differ in their level of activity, subsequent analysis focused on the distribution of behaviours within the categories. Table 1 below shows the percentage of behaviours which fell into each CABS category:

Behavioural category	Experimental		Control	
	Mean	Standard Deviation	Mean	Standard Deviation
General encouragement	29.04	8.43	33.13	7.10
Reinforcement	25.99	8.13	20.51	5.24
General technical instruction	21.43	5.61	24.55	5.56

- Analysis showed that Reinforcement was the significant major discriminator between the two groups.
- Reinforcement, general technical instruction and general encouragement had the highest mean scores for both conditions. General encouragement had the highest mean score in both conditions, while reinforcement was second highest in the experimental condition and general technical instruction was second highest in the control condition. Standard deviation scores were highest in these three behaviour categories, suggesting some individual differences.
- The other nine conditions had significantly lower scores in both conditions. In the experimental condition - organisation (4.80), mistake-contingent encouragement (4.25), non-reinforcement (3.28), mistake-contingent technical instruction (3.12) and general communication (3.11) all had mean scores between 3 and 5. Similar scores for these categories were also recorded in the control condition, although non-reinforcement (2.77) and general communication (2.30) mean scores were slightly lower.
- In both conditions, punitive technical instruction (exp – 0.62, cont – 1.04) and keeping control (exp – 1.18, cont – 1.46) had the lowest reported mean scores.

# Coach effectiveness training: a cognitive-behavioral approach to enhancing relationship skills in youth sports coaches. Smith, R. E., Smoll, F. L. and Curtis, B. (1979), *Journal of Sport Psychology*, 1, (1), 59–75.

## 6. Key findings . . . continued

### Differences in players' perceptions of coaching behaviours

- A step-wise discriminant analysis of the behavioural ratings made by the two groups of children revealed a significant difference in group centroids based on the 12 CBAS behaviours.
- Follow-up univariate ANOVA showed significant group differences on six of the behavioural categories:
  - Experimental group coaches were rated as more frequently engaging in Reinforcement, Mistake-contingent encouragement and General technical instruction, and less frequently engaging in Non-reinforcement, Punishment and Punitive technical instruction.

### Player attitudes and self-esteem

- Evaluative reactions to coach and team-mates: Data indicated that children who played for the trained coaches did not differ in liking for baseball compared with those who played for the untrained coaches. However they indicated greater enjoyment in having played for their coaches and a stronger desire to play for them in the future. They also rated the trained coaches as better teachers of baseball and evaluated the relationships which existed among team-mates more positively.
- Post season self-evaluations: On the measure of general self-esteem no significant group difference was found. Likewise, the children's evaluations of their own baseball ability did not differ. However, significant differences were found in the children's perceptions of their coaches' and team-mates' evaluation of their skills. Children who played for the trained coaches felt that both their coach ( $p < 0.05$ ), and their team-mates ( $p < 0.02$ ) evaluated their skills more highly. No difference was found in the children's perception of their parents' evaluation of their skills.
- Pre-post self-esteem changes: Total samples of children ( $N = 325$ ) who played for the trained and untrained coaches did not differ in post season self-esteem scores. However self-esteem data obtained in similar interviews conducted the previous year were available for 75 of the children who played for the untrained coaches and for 112 children who played for the trained coaches allowed for changes in self-esteem scores to be examined. Analysis showed a significantly higher level of self-esteem in the children who had played for the trained coaches ( $p < 0.01$ ). In addition,  $t$ -tests showed a significant increase in scores for the children who had played for trained coaches whereas the control group children exhibited no significant change in scores.
- Self-esteem as a moderator variable: The total player sample was divided into high, moderate and low self-esteem groups. Analysis showed a significant groups effect only at the low self-esteem level.
- On the measure of how well team-mates got along with one another: significant main effects were found for both coach groups and self-esteem. Children who played for the trained coaches rated their teams as higher in intra-team attraction, as did children high in self-esteem.

# Coach effectiveness training: a cognitive-behavioral approach to enhancing relationship skills in youth sports coaches. Smith, R. E., Smoll, F. L. and Curtis, B. (1979), *Journal of Sport Psychology*, 1, (1), 59–75.

## 6. Key findings . . . continued

### Team records

- Given the strong attitudinal differences found between children who played for the two groups of coaches, it was deemed important by the researchers to examine the potential influence of won-lost records.
  - The trained coaches had a mean winning percentage of 54%, whereas for the untrained coaches this was 44.7%. These findings were however not statistically significant.

## 7. Possible conclusions

- Training programmes exert a significant and positive influence on overt coaching behaviours.
- Training programmes exert a significant and positive influence on player-perceived behaviours.
- Training programmes exert a significant and positive influence on children's attitudes towards their coach / towards their team-mates / towards many aspects of their athletic experience.
- Children who play for trained coaches develop positive self-esteem / develop more positive self-esteem than children who play for untrained coaches...
- Children who play for trained coaches evaluate their coach / the interpersonal climate of their teams more positively than children who play for untrained coaches.
- Self-esteem is an important moderator of attitudinal responses to coaching behaviours.

# Social enhancement and impairment of performance in the cockroach. Zajonc, R. B., Heingartner, A., and Herman, E. M. (1969), *Journal of Personality and Social Psychology*, 13 (2), 83-92.

## 1. Theory/ies on which the study is based

- Poor performance in group situations can be attributed to distraction, (Gates and Allee, 1933).
- The presence of others can have a negative effect on performance, (Gates and Allee, 1933).
- Conversely, the presence of others can lead to improvements in performance.
- Zajonc (1965), suggested these two seemingly conflicting results could be reconciled if one assumed the presence of others to be a source of general drive (D). Therefore as well as the presence of others being a source of specific cues, reinforcement and specific excitation (e.g. as in aggression), it can also direct behaviour by acting as source of non-specific arousal which acts as a general energiser of all responses that are likely to be emitted in the given situation. It is assumed that the arousal effects would be those that are predicted by the Spence-Hull drive theory (Spence, 1956): if the animal's dominant responses are appropriate from the point of view of the experimental situation, the presence of others will enhance them; and the resulting performance will appear as being improved. If these dominant responses are largely inappropriate, however, performance in the presence of others will appear as being impaired.
- Socially facilitated increments in performance are usually found for behaviours that are either very well learned or instinctive (e. Travis, 1925; Tolman and Wilson, 1965; Scott and McCray, 1967).

## 2. Background to the study

- In 1933 Gates and Allee reported a study on the maze learning of isolated and grouped cockroaches in which they observed a clear inferiority of performance of the grouped subjects. They attributed these effects to distraction, saying that cockroaches learning in groups were responding not only to the physical topography of the maze but to the social situation as well, and that the 'chemical traces introduced by one of the other cockroaches simultaneously occupying the maze may have acted to interfere with orientation'. Gates and Alice used an E-shaped maze suspended over water. Light served as a noxious stimulus, while an opaque bottle located in the central portion of the maze provided the subjects with the only means of escape. The procedure entailed placing the cockroach (or cockroaches) at one of the terminals of the maze and observing the time required to reach the goal bottle. Because of the many spatial alternatives available—at first all equally inviting—many response tendencies were elicited that were not correct. In fact, of the many ways in which the cockroach could proceed in the E-maze, only one led to escape, and hence to what the experimenter would consider as appropriate behaviour. To the extent that the presence of conspecifics did act as a source of general drive (D), these many 'inappropriate' response tendencies were energised, delaying the emission of the appropriate one.
- Research by Tolman (1965) found that feeding behaviour of young chicks was facilitated by the presence of a companion separated from the subject by a plexiglass partition, and also by feeding the subject in front of a mirror. These increments, however, were not as impressive as those obtained with a co-acting companion.
- Other studies using animal or human subjects also found a deterioration of performance under social conditions (Allee and Masure, 1936; Klopfer, 1958; Pessin and Husband, 1933). In agreement with Gates and Allee, Jones and Gerard (1967) have recently ascribed all these effects to distraction.

# Social enhancement and impairment of performance in the cockroach. Zajonc, R. B., Heingartner, A., and Herman, E. M. (1969), *Journal of Personality and Social Psychology*, 13 (2), 83-92.

## 2. Background to the study . . . continued

- Research with humans, where information about the subject's response hierarchy were available prior to the tests of social effects, has provided substantial support for the drive theory of social facilitation, (e.g. Cottrell, Rittle, and Wack, 1967; Zajonc and Sales, 1966) However, until this study, procedures of this sort had not been employed with animals as participants.
- Zajonc et al. proposed that if a situation in which the cockroach's response tendencies would be largely 'correct' or 'appropriate' could be contrived, an increment rather than a decrement in performance should be obtained under social conditions. They proposed that in comparison with maze performance, this situation would provide a rather stringent test of the drive theory of social facilitation.
- This paper therefore reports two experiments in which the performance of cockroaches in a maze and in a runway was compared under various social conditions.
- In all the experiments socially mediated performance decrements in the maze and socially mediated increments in the straight runway were expected.

## 3. Research method

- This study involved the use of two laboratory experiments.
- In experiment 1:
  - The independent variables (IVs) were:
    - (i) Whether the cockroaches performed alone or in pairs (32 of the cockroaches)
    - (ii) whether the cockroaches performed alone or in pairs with an audience (40 of the cockroaches)
    - (iii) Whether the cockroach/cockroaches had to traverse a maze or a straight runway.
  - The dependent variable (DV) was the starting latency and the time taken to reach the goal box so the guillotine gate could be lowered.
- In experiment 2:
  - The independent variables (IVs) were:
    - (i) Whether the cockroaches had to traverse a maze or a straight runway
    - (ii) Whether the cockroaches had to traverse a maze / runway outfitted with mirrors alongside the vertical walls; whether the cockroaches had to traverse a maze / runway stimulated by the presence of olfactory cues associated with their conspecifics' or whether the cockroaches had to traverse a maze / runway alone, in socially neutral conditions.
  - The dependent variable (DV) was the starting latency and the time taken to reach the goal box so the guillotine gate could be lowered.

# Social enhancement and impairment of performance in the cockroach. Zajonc, R. B., Heingartner, A., and Herman, E. M. (1969), *Journal of Personality and Social Psychology*, 13 (2), 83-92.

## 4. Sample

### Experiment 1

- 72 adult, female cockroaches.
- For at least one week prior to the first experimental trial they were housed in individual mason jars with screened lids and kept in the dark with a relatively constant temperature of 75 degrees Fahrenheit.
- They were fed an 'ad lib' diet of peeled and sliced apples – meaning this food was available at all times with the quantity and frequency of consumption being the free choice of the cockroach.

### Experiment 2

- 180 female cockroaches.
- All cockroaches were kept in individual mason jars for 4 days prior to the experiment.
- $\frac{1}{3}$  (60) of the cockroaches were assigned to the mirror condition (Mi),  $\frac{1}{3}$  (60) to the odour condition (Od) and  $\frac{1}{3}$  (60) to the solitary (alone) condition.

## 5. Outline of the procedure/study

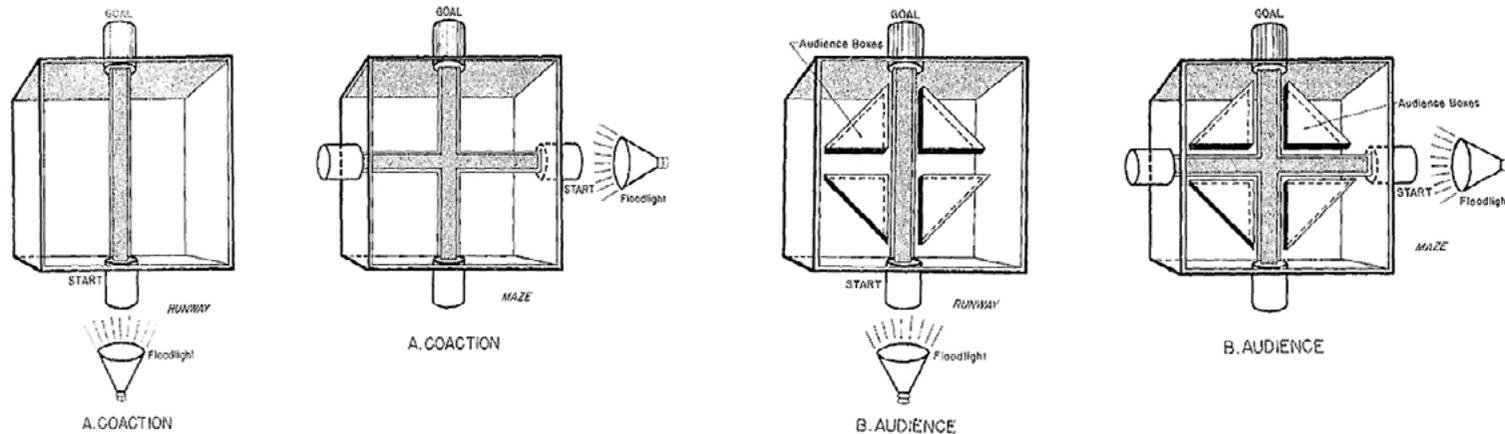
### Experiment 1

- This experiment had two major purposes:
  - (i) To test the drive theory of social facilitation
  - (ii) To determine if socially mediated effects obtained in cockroaches when the participants could not profit from directive cues provided by companions (i.e. an audience) would affect performance times.
- Apparatus: The basic apparatus consisted on a 20 x 20 x 20-inch clear plexiglass cube outfitted so as to house either a maze or a runway. A 150 -watt floodlight served as a source of noxious stimulation. In the centre of each vertical wall of the plexiglass housing, 8 $\frac{1}{4}$  inches from the top, was a rectangular 1 $\frac{3}{4}$  x  $\frac{3}{4}$ -inch opening, which could be closed by means of a guillotine gate made out of sheet metal. A set of tracks on the exterior of each opening served as a shoe for a goal box or a starting box, clamping it firmly in place against the wall opening. Both the goal box and the starting box were made of 4-inch clear plexiglass tubing. A square flange that could slide into the shoe on the vertical wall of the housing was affixed to the opening of the boxes, while the other end of the tubing was sealed with  $\frac{1}{4}$ -inch clear plexiglass. The maze and the runway could be suspended in the housing flush with the goal boxes and the starting boxes. Both the runway and the maze were made of black bakelite floor 2 inches wide, with walls made of clear plexiglass, 1 inch high. The runway and the maze were provided with clear plexiglass tops  $\frac{1}{8}$ -inch thick. The runway consisted of a straight track running between two opposite vertical walls, and was 20 inches long. The maze was made of two runways, placed in the same plane and perpendicular to each other, thus forming a cross with the walls of the intersection removed. The lengths of the paths in the runway and in the maze, namely those leading from the starting box to the goal box or to a cul-de-sac, were 20 inches. The guillotine gates that separated the starting and goal boxes from the runway or maze were made of galvanized sheet metal. To attract the cockroach to the goal box an opaque cover, painted flat black on the inside, was placed over the box making its interior dark. A flat black poster-board, covering the entire 20 X 20-inch area, was hung on the wall which held the goal box. See diagrams overleaf.

**Social enhancement and impairment of performance in the cockroach.** Zajonc, R. B., Heingartner, A., and Herman, E. M. (1969), *Journal of Personality and Social Psychology*, 13 (2), 83-92.

**5. Outline of the procedure/study . . . continued**

Diagrams of runways and mazes used in the coaction and in the audience treatments of Experiment I.



For the groups which had a passive audience, four 9 x 9 x 1 inch boxes with plexiglass sides and tops and bakelite floors were used. These boxes were placed inside the plexiglass cube housing in such a manner that their floors were flush with the floors of the runway or the maze and their sides directly contiguous with the walls of the runway or the maze. When these boxes were in position almost the entire extent of walls of the runway or maze were in direct contact with the sides of the audience boxes. Air holes in the sides of the boxes lined up with air holes in the walls of the runway and the maze to allow transmission of olfactory cues.

• **Procedure:**

- Before each trial the runway (or the maze) was swabbed with alcohol and then allowed to dry thoroughly. The starting box and goal box were swabbed in the same manner before each set of 10 trials.
- The cockroach was placed in the starting box which was covered with an opaque container similar to the one that covered the goal box.
- Each trial began by removing the cover, turning on the floodlight, and removing the guillotine door separating the opening in the starting box from the runway or the maze. The floodlight was always in line with the runway or the maze and 10 inches directly behind it. No light other than that provided by the floodlight was present in the experimental room.
- The trial was terminated when the cockroach (or the pair of cockroaches) entered the goal box and the guillotine gate was lowered behind it (or them), or in 5 minutes—whichever was earlier. The guillotine gate was always lowered immediately after the cockroach's last leg crossed the entrance of the goal box.
- In the co-action condition the starting latencies and the running times were scored for each subject individually, although the gate was not lowered until the last member of the pair entered the goal box.

# Social enhancement and impairment of performance in the cockroach. Zajonc, R. B., Heingartner, A., and Herman, E. M. (1969), *Journal of Personality and Social Psychology*, 13 (2), 83-92.

## 5. Outline of the procedure/study . . . continued

- For the 32 animals involved in the co-action condition and the 40 that were involved in the audience condition:
  - (i) Half of the cockroaches worked in the runway and half in the maze.
  - (ii) In addition, within each combination of condition and task, half of the animals were run in the alone condition and half in the social condition.
  - (iii) In the co-action condition participants were placed into starting boxes in pairs. For purposes of identification they were marked with airplane dope, one white and one blue.
  - (iv) In the audience condition 10 adult female were placed in each of the four audience boxes. A control group of 20 cockroaches, which was not to be exposed to a passive audience, worked with audience boxes in position, but empty and clean.
  - (v) All cockroaches run in the audience condition and in their proper control conditions were run individually.
  - (vi) Starting latencies to the nearest second and total running times to the nearest tenth of a second were recorded. Starting latency consisted of the interval beginning with the opening of the guillotine gate of the starting box and ending at the time the last part of the roach's body left the starting box.
- In all conditions the subjects were given 10 consecutive trials, all separated by 1-minute inter-trial intervals.
- In short, cockroaches were observed alone and under two types of social treatments, co-action and audience whilst they traversed either a straight runway or a maze.

## Experiment 2

- This experiment attempted to determine if socially mediated effects such as those obtained in Experiment 1 would be produced if the immediate presence of conspecifics (members of the same species) were somehow curtailed or reduced.
- Two conditions were employed. In both conditions there were no other cockroaches beside the participant cockroach. Both dealt with some components of the presence of conspecifics, one emphasising its cue effects, the other emphasising its energising (general arousal) effects. Therefore, in the first the insects ran in mazes and runways which were outfitted with mirrors alongside their vertical walls. In the second treatment regular runways and mazes were utilised, but the animals were stimulated by the presence of olfactory cues associated with their conspecifics.
- These conditions were compared with one in which the insects were observed under solitary and socially neutral conditions.

## Apparatus and Procedure

- An appropriately modified version of the apparatus from Experiment 1 was used.
  - In the Mi treatment a runway and a maze were used which were equipped with reflecting half-aluminised film affixed to the entire extent of the walls. Otherwise the apparatus was the same as in the alone condition of Experiment 1.

# Social enhancement and impairment of performance in the cockroach. Zajonc, R. B., Heingartner, A., and Herman, E. M. (1969), *Journal of Personality and Social Psychology*, 13 (2), 83-92.

## 5. Outline of the procedure/study . . . continued

- In the Od treatment the regular runway and maze from the audience condition of Experiment 1 were used which, it will be recalled, had holes drilled in their walls. An olfactory social stimulus was provided by placing an egg carton impregnated with the odour of conspecifics inside the housing of the apparatus and 4 inches directly beneath the maze or the runway. The egg carton was thoroughly impregnated with the odours of conspecifics by having it in the quarters of the colony for several days prior to the tests. Several cartons were kept in the quarters of the cockroach colony during the course of the experiment, and during each testing session a freshly impregnated carton was always used.
- The AI treatment was the same as the Od treatment except that a fresh clean egg carton, not impregnated with cockroach odour, was placed 4 inches beneath the runway or the maze.
- The same procedure was used for scoring latencies and running times as in Experiment 1.

Source: Social enhancement and impairment of performance in the cockroach. Zajonc, Robert B.; Heingartner, Alexander; Herman, Edward M. *Journal of Personality and Social Psychology*, Vol 13(2), Oct 1969, 83-92. <http://dx.doi.org/10.1037/h0028063>

## 6. Key findings

### Experiment 1

- The following table shows the results for experiment 1:

Running time and starting latency in seconds for subjects tested alone, in coaction, and in the presence of an audience				
Treatment	Task			
	Runway		Maze	
	Alone	Social	Alone	Social
<b>Coaction</b>				
Starting latency	8.25 (8)	6.88 (8)	10.56 (8)	11.19 (8)
Running time	40.58 (8)	32.96 (8)	110.45 (8)	129.46 (8)
<b>Audience</b>				
Starting latency	14.80 (10)	9.35 (10)	37.55 (10)	22.75 (10)
Running time	62.65 (10)	39.30 (10)	221.35 (10)	296.64 (10)
<b>Both treatments</b>				
Starting latency	11.89 (18)	8.25 (18)	25.56 (18)	17.61 (18)
Running time	52.84 (18)	36.48 (18)	172.06 (18)	222.34 (18)

Note: Averages of medians. Figures in parentheses indicate the number of roaches in each cell.

# Social enhancement and impairment of performance in the cockroach. Zajonc, R. B., Heingartner, A., and Herman, E. M. (1969), *Journal of Personality and Social Psychology*, 13 (2), 83-92.

## 6. Key findings . . . continued

- With respect to starting latencies, all effects failed to reach acceptable levels of significance.
- Cockroaches running in the maze co-action condition took longer to reach the goal box than cockroaches running alone (replicating the findings of Gates and Allee).
- However, cockroaches running in the runway co-action condition took less time to reach the goal box than the cockroaches that ran alone.
- The same pattern of results was found for the audience condition.
- Hence the three-way interaction was not significant.
- Running times and latencies were substantially shorter in the co-action cockroaches than in the audience groups.

### To summarise

In both conditions (coactions and audience) maze performance was impaired while runway performance was facilitated when compared to solitary performance.

### Experiment 2

**Running time and starting latency in seconds for subjects tested alone, with the mirror, and in the presence of conspecific odor**

Treatment	Task	
	Runway	Maze
<b>Mirror</b>		
Starting latency	27.38	28.88
Running time	77.21	160.71
<b>Odor</b>		
Starting latency	20.00	24.97
Running time	69.53	245.72
<b>Alone</b>		
Starting latency	22.67	18.33
Running time	55.67	219.63

Note: Averages of medians. These means are based on 30 independent observations in each cell.

## Social enhancement and impairment of performance in the cockroach. Zajonc, R. B., Heingartner, A., and Herman, E. M. (1969), *Journal of Personality and Social Psychology*, 13 (2), 83-92.

### 6. Key findings . . . continued

- The latencies did not differ across conditions.
- The interactions between conditions and tasks did not attain levels of statistical significance.
- However, with respect to total running times both main effects and the interaction were significant ( $p < 0.05$  for conditions;  $p < 0.001$  for tasks; and  $p < 0.001$  for the interaction between them).
- Running times in the straight runway were not improved in the two social conditions (Mi and Od) - both Mi and Od participants took longer to traverse the runway than the AI participants
- Maze-running in the Mi condition was facilitated i.e. faster, whereas it was impaired for the Od condition i.e. slower.

### 7. Possible conclusions

- The presence of an audience of conspecifics is a sufficient condition for the enhancement of dominant responses, such that the performance of the subject in a one-alternative task is improved and the performance of the subject in a multi-alternative task is impaired.
- The mere presence of conspecifics is a source of general arousal that enhances the emission of dominant responses.
- Enhancement as well as impairment of performance can be obtained with cockroaches, depending on whether a simple (straight run) or a complex task (a maze) was used, and therefore depending on whether the situation was more likely to recruit appropriate or inappropriate response tendencies.
- The partial presence of conspecifics may have distracting effects.
- In order for drive effects to take place the presence of conspecifics must be actual.
- Partial presence, such as the presence of olfactory traces, is not sufficient to produce effects consistent with the drive theory of social facilitation.
- The presence of others can enhance performance in either well learned or instinctive behaviours.



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#### General qualifications

Telephone 01223 553998

Facsimile 01223 552627

Email [general.qualifications@ocr.org.uk](mailto:general.qualifications@ocr.org.uk)

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