

**SENSITIVITY TO KINEMATIC
SPECIFICATION OF
EMOTION AND
EMOTION-RELATED
STATES**

A thesis submitted in partial fulfillment
of the requirements for the
Degree of
Master of Science in Psychology
at the
University of Canterbury
by
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University of Canterbury

2000

Acknowledgements

There are so many people I wish to thank for all their support and encouragement as I have worked on this thesis for these past two years.

Firstly, I thank my supervisor, Dr Dean Owen, for introducing me to the ecological approach to psychology. Thank you, Dean, for the instruction, guidance, support and encouragement you have given me.

Thank you to Professor Ken Strongman for his willingness to share his expertise in the area of emotion research, as well as for the support and encouragement he has given me also.

My special thanks and appreciation to Shirley Bowie who has unwaveringly been there for me through thick and thin, every step of the way, both on and off campus.

Thank you Judith Kime for believing I could do this!

Amber Porter, thank you for your timely offerings of insight and humour from afar, urging me on through the dark hours.

My thanks and appreciation extend to Warren King for all the time and effort he has given to assisting me with the computer programming and tuition I required in order to carry out this project.

Thank you Glenn Lewis for so generously sharing your computer and office with me for such a long time.

My thanks to Howard Patterson and John Barton for their assistance also.

To everyone who has assisted with or participated in this investigation, you know who you are. Thank you. This thesis would never have happened without you.

CONTENTS

	PAGE
Abstract	1
Introduction	2
Implications of study	7
Method	8
Full view study	9
apparatus	9
participants	9
procedure	9
Preparation for the point-light study	12
Outline of Events on the accompanying CD ROM	13
Point-light study	15
participants	15
apparatus	15
procedure	16
Results	19
data reduction	19
testing for patterns of relationship between participant perceptions of the full view and the point light display	19
Discussion	49
patterns of relationship between participant perceptions of the full view and the point- light displays	49
patterns within the data	52
inconsistencies within the data	57
analysis of emotionally expressive events as they unfold over time	65
strengths and weaknesses of the study	73

PAGE

future directions	75
Conclusion	80
Reference List	82
Appendix	87

LIST OF FIGURES

	PAGE
Figure 1. Computer response screen as used for both full view and point-light studies.	11
Figure 2. Video frame shown to participants before point-lights were applied.	16
Figure 3. Same video frame as shown to participants after point-lights were applied.	17
Figure 4. Line graph illustrating the correlation between the average confidence ratings of perception of jubilation across all events for the full view and the point-light conditions.	21
Figure 5. Scatterplot illustrating the correlation between the average confidence ratings of perception of jubilation across all events for the full view and the point-light conditions. Event numbers are shown beside the points plotted.	21
Figure 6. Line graph illustrating the correlation between the average confidence ratings of perception of exultation across all events for the full view and the point-light conditions.	22
Figure 7. Scatterplot illustrating the correlation between the average confidence ratings of perception of exultation across all events for the full view and the point-light conditions. Event numbers are shown beside the points plotted.	22
Figure 8. Line graph illustrating the correlation between the average confidence ratings of perception of excitement across all events for the full view and the point-light conditions.	23

	PAGE
Figure 9. Scatterplot illustrating the correlation between the average confidence ratings of perception of excitement across all events for the full view and the point-light conditions. Event numbers are shown beside the points plotted.	23
Figure 10. Line graph illustrating the correlation between the average confidence ratings of perception of rage across all events for the full view and the point-light conditions.	103
Figure 11. Line graph illustrating the correlation between the average confidence ratings of perception of frustration across all events for the full view and the point-light conditions.	103
Figure 12. Line graph illustrating the correlation between the average confidence ratings of perception of happiness across all events for the full view and the point-light conditions.	104
Figure 13. Line graph illustrating the correlation between the average confidence ratings of perception of anger across all events for the full view and the point-light conditions.	104
Figure 14. Line graph illustrating the correlation between the average confidence ratings of perception of surprise across all events for the full view and the point-light conditions.	105
Figure 15. Line graph illustrating the correlation between the average confidence ratings of perception of fear across all events for the full view and the point-light conditions.	105
Figure 16. Line graph illustrating the correlation between the average confidence ratings of perception of agitation across all events for the full view and the point-light conditions.	106
Figure 17. Line graph illustrating the correlation between the average confidence ratings of perception of shock across all events for the full view and the point-light conditions.	106

Figure 18.	Line graph illustrating the correlation between the average confidence ratings of perception of embarrassment across all events for the full view and the point-light conditions.	107
Figure 19.	Line graph illustrating the correlation between the average confidence ratings of perception of affection across all events for the full view and the point-light conditions.	107
Figure 20.	Line graph illustrating the correlation between the average confidence ratings of perception of despair across all events for the full view and the point-light conditions.	108
Figure 21.	Line graph illustrating the correlation between the average confidence ratings of perception of dejection across all events for the full view and the point-light conditions.	108
Figure 22.	Column graph illustrating participants' perception of emotion categories when viewing Event 54 in the full view condition.	31
Figure 23.	Column graph illustrating participants' perception of emotion categories when viewing Event 54 in the point-light condition.	31
Figure 24.	Column graph illustrating participants' perception of emotion categories when viewing Event 32 in the full view condition.	32
Figure 25.	Column graph illustrating participants' perception of emotion categories when viewing Event 32 in the point-light condition.	32
Figure 26.	Column graph illustrating participants' perception of emotion categories when viewing Event 20 in the full view condition.	33
Figure 27.	Column graph illustrating participants' perception of emotion categories when viewing Event 20 in the point-light condition.	33

	PAGE
Figure 28. Column graph illustrating participants' perception of emotion categories when viewing Event 46 in the full view condition.	34
Figure 29. Column graph illustrating participants' perception of emotion categories when viewing Event 46 in the point-light condition.	34
Figure 30. Column graph illustrating participants' perception of emotion categories when viewing Event 21 in the full view condition.	36
Figure 31. Column graph illustrating participants' perception of emotion categories when viewing Event 21 in the point-light condition.	36
Figure 32. Column graph illustrating participants' perception of emotion categories when viewing Event 41 in the full view condition.	37
Figure 33. Column graph illustrating participants' perception of emotion categories when viewing Event 41 in the point-light condition.	37
Figure 34. Column graph illustrating participants' perception of emotion categories when viewing Event 40 in the full view condition.	39
Figure 35. Column graph illustrating participants' perception of emotion categories when viewing Event 40 in the point-light condition.	39
Figure 36. Column graph illustrating participants' perception of emotion categories when viewing Event 18 in the full view condition.	40
Figure 37. Column graph illustrating participants' perception of emotion categories when viewing Event 18 in the point-light condition.	40
Figure 38. Column graph illustrating participants' perception of emotion categories when viewing Event 9 in the full view condition.	42
Figure 39. Column graph illustrating participants' perception of emotion categories when viewing Event 9 in the point-light condition.	42

	PAGE
Figure 40. Column graph illustrating participants' perception of emotion categories when viewing Event 37 in the full view condition.	43
Figure 41. Column graph illustrating participants' perception of emotion categories when viewing Event 37 in the point-light condition.	43
Figure 42. Column graph illustrating participants' perception of emotion categories when viewing Event 12 in the full view condition.	44
Figure 43. Column graph illustrating participants' perception of emotion categories when viewing Event 12 in the point-light condition.	44
Figure 44. Column graph illustrating participants' perception of emotion categories when viewing Event 42 in the full view condition.	46
Figure 45. Column graph illustrating participants' perception of emotion categories when viewing Event 42 in the point-light condition.	46
Figure 46. Column graph illustrating participants' perception of emotion categories when viewing Event 34 in the full view condition.	47
Figure 47. Column graph illustrating participants' perception of emotion categories when viewing Event 34 in the point-light condition.	47
Figure 48. Column graph illustrating participants' perception of emotion categories when viewing Event 4 in the full view condition.	48
Figure 49. Column graph illustrating participants' perception of emotion categories when viewing Event 4 in the point-light condition.	48
Figure 46. Column graph illustrating participants' perception of emotion categories when viewing Event 34 in the full view condition.	47
Figure 47. Column graph illustrating participants' perception of emotion categories when viewing Event 34 in	

the point-light condition.

47
PAGE

Figure 50.	Two dimensional display showing body movement pattern of Event 42 for 0.125 sec.	72
Figure 51.	Two dimensional display showing body movement pattern of Event 4 for 0.20 sec.	72
Figure 52.	Two successive frames, one pasted over the other, showing the conversion process from full view to point-light display.	92

LIST OF TABLES

Table 1.	Numbers of participants who viewed each event in both conditions	101
Table 2	Pearson correlations between the average confidence ratings and proportion of variance accounted for the full view and point-light conditions for each emotion category.	20
Table 3.	Means and standard deviations of confidence ratings for the full view and point-light conditions for each emotion category.	24
Table 4.	Pearson correlations between the average confidence ratings for the full view (above the diagonal) and point-light (below the diagonal) conditions for each pair of emotion categories (N=59 events). The lighter shading highlights significantly positive, whereas the darker indicates significantly negative correlations.	27

Table 5. Proportion of variance between the average confidence ratings accounted for the full view (above the diagonal) and point-light (below the diagonal) conditions for each pair of emotion categories (N=59 events). The lighter shading highlights significantly positive, whereas the darker indicates significantly negative correlations.

ABSTRACT

The purpose of this study was exploratory, from an ecological point of view. The aim was to find out whether and, if so, to what extent, information about the expression of emotion and emotion-related states is detectable through observation of body movement alone. Participants in a full view study observed a diverse selection of spontaneous expressions of emotion, collected on videotape. The events they indicated as being the most reliable expressions of emotion were converted to point-light displays. These displays were likewise shown to a further group of participants. Patterns of relationship between detection of emotion and emotion-related states for the full view and point-light conditions were found. Firstly, it became evident that indications of such states are reliably preserved from the full view to the point-light displays. Secondly, patterns of clustering were found, which fit well with the "primary" emotions of joyfulness, anger, fear, sadness and surprise. Consistencies or otherwise in perceptions from one condition to the other seem largely due to the extent to which the expresser's body is fully and uprightly shown within the display, the amount of information available for detection of the "other" the expresser may be interacting with, whether or not the flow of expression is interrupted, and the level of activation of body movements. Analysis of the temporal structure of the expressive and perceptive flow, characteristic of events unfolding over time, supports the view that emotions play an important role in human functioning, serving to safeguard goals. Affect is considered in terms of the person-environment relationship, wherein emotion-related states emerge as part of a context within which various lines of action unfold. "Secondary" emotions seem to exist within this socially and culturally negotiated level of interaction in the environment. It is proposed that the expressive behaviours evident within transformations of body movement unfold over time sequentially, relative to the effectiveness of individual's negotiative interactions with others facilitating progress towards the personal goal.

INTRODUCTION

My interest in carrying out this research was piqued by the often-expressed notion that the degree of accuracy of our perception of others' emotional states depends largely on intuitive skill. How could it be that we manage, otherwise, to decipher the complex array of frequently conflicting information presented not only verbally but nonverbally as well, via facial expressions, eyes, gaze, blink rates, bodily movements and behaviours, prosodic features, and so on? Approaches to the study of emotion are equally diverse, generating intense debate as to which of these are the most appropriate and valid. Verbal expression has received considerable attention in its own right. Since Darwin's (1872) publication entitled "The Expression of Emotions in Man and Animals", its nonverbal accompaniments have undergone much scientific scrutiny also. In his discussion concerning why we do not use language alone when communicating, Argyle (1988) argues that nonverbal signals for interpersonal attitudes are considerably more powerful than initially similar verbal ones. He speculates the reasons for this as being largely due to our having inherited, in part, animals' mostly innate nonverbal system for interpersonal "signals" which operates directly, evoking bodily responses which prepare the "receiver" for immediate action. Verbal "signals", on the other hand, usually convey information about the outside world that has been carefully considered, leading to action only if linked through learning to some "drive state". Consequently, he views the impact of

words as weaker and less direct than that of nonverbal signals. He suggests that the latter, being less well controlled are also, therefore, more likely to be genuine.

As Ekman and Friesen (1968) note, their research indicates that most interactive nonverbal behaviour appears to be carried out with little conscious choice or registration. Failure to “inhibit” what is shown seems to occur due to information concerning that which is happening not generally being within awareness.

Birdwhistle’s (1970) findings also support Argyle’s speculations, due to his considerable studies leading him to approximate nonverbal communication as accounting for at least 60-70 % of that which we communicate to one another. A further reason Argyle offers is that our focusing attention on nonverbal information or making it too explicit can be disturbing, suggesting this may be why the conversation or task occupies the verbal channel, while the negotiation of social relationships is conducted nonverbally. This idea has been reinforced since, for example, by Hatfield, Cacioppo, and Rapson (1992), who show that an ability to synchronize moods through nonverbal gestures seems crucial to smooth interaction between people. Archer and Akert’s (1977) findings indicate the likelihood that nonverbal cues provide a qualitative “script” without which verbal cues cannot be interpreted accurately. It is findings such as these that prompted my particular interest in exploring the nonverbal expression of emotion further.

Due to accumulated evidence, it is widely held that the face is the best “sender” of nonverbal “signals” (cf. Ekman & Friesen, 1969a, 1969b; Argyle, 1988). However, as Ginsburg and Harrington (1996) point out, while agreeing with the view that facial displays do express emotion states, Izard and others (cited in Ginsburg & Harrington, 1996) openly acknowledge the likelihood that such observable expression may not be a necessary component of emotion. Bodily preparations for

action along with the patterns of action that are performed during a situated event, nevertheless, do seem to be crucial. Patterson (1983) suggests that there are 5 basic functions of body movements, which are to give information, regulate interaction, express affective states, indicate social control, and to facilitate task goals. Wallbott (1998) has found evidence that movement and postural behaviour is indicative of the quantity (intensity) of different emotions and that some features of these seem to exist which facilitate the identification of quality (specific emotion and emotion-related states). He found this to be so regardless of expressers' differing styles, which strengthens the likelihood that emotions seem to be a reasonably stable phenomenon. McClenny and Neiss (1989) found that happiness and sadness were recognised better through observation of the body than the face. As Runeson and Frykholm (1983) point out, to the extent that emotions influence movements, they must be specified in the kinematic pattern by biomechanical necessity. Ginsburg and Harrington (1996) urge further investigation be carried out in order to determine whether there may be coherently organised patterns of bodily action that reliably indicate and discriminate among emotions. Montepare et al. (1987) demonstrate that observers are able to identify specific emotions from variations in walking style at better than chance levels. Displays were shown to participants of videotaped walkers (actors) imagining themselves in each of four emotion situations. Scherer and Wallbott (1990) have also found evidence that movements may be influenced by the emotional state of a person.

In addition, as Baron (1981) observes, emotional expression seems to draw a perceiver into the nature of another's psychological state to a greater degree than most other properties of the social environment. In other words, emotional expression appears to "demand" reciprocal behaviours. While conducting research not designed

to deal with the emotions, Michotte (1950) found it necessary to consider the likelihood of emotion being a modification of the observer in regard to objects, people, events, and so on. He explains this in terms of a functional connection, occurring as a result of the nature of certain structural organisations. He concludes that motor reaction, when related in certain ways with other objects, people, and events, is of considerable importance as expressive behaviour.

In the following investigation, the nonverbal expression of emotion was explored from an ecological point of view. Gibson (1979) proposes the theory of affordances, whereby any substance, surface or layout within the environment has some affordance for benefit or injury to the perceiver, some of the richest and most elaborate of these being provided for us by other people. As argued by Gibson (1979, p135; 1986,p42), "behaviour affords behaviour" and although very complex, the perceiving of these mutual affordances is lawful and based on the pickup of information in smell, taste, sound, touch, and ambient light. He reasons that as individuals have surfaces that reflect the light, information specifying what they are, invite, threaten or do, can therefore be found in the light.

Due to the successful development and application of point-light displays to study global dynamic events involving the perception of biomechanical information available within the environment (see Johansson, 1973, 1975, 1976; Runeson & Frykholm, 1981, 1983.), I considered this a most appropriate method to use for this study. As Gibson (1965) stresses, visual perception of motion is inseparable from research on the visual perception of solid objects, space, and temporal sequence. Johansson (1973) was the first to attempt to understand the laws organising and specifying the very complex and temporally extended sensory information we perceive through observing biological motion. He was particularly aware that static

perception rarely exists within the natural environment. Usually there is evidence of motion or change. For this reason, he also considered invariances in the optical flow as fundamental for visual analyses. Towards this aim he used the point-light technique to reduce visibility of body movements to the extent that only moving points of light against a black background could be seen. As Michaels and Carrello (1981, p28) explain:

The way in which the lights change relative to each other in time and space specifies the event. These stimuli separate "human forms" from invariants specifying humans moving.

They describe *structural invariants* as patterns that stay constant amidst change, and *transformational invariants* as styles of change that stay constant while applied to structures. Together these offer the minimal description of a perceptual event.

Runeson & Frykholm (1983) have used the point-light technique extensively, particularly to investigate the perception of intention. In their view emotions should be perceptually recognisable through observation of the pattern of body movements, due to psychological determinants of behaviour being necessarily and specifically linked to these. Therefore, according to the kinematic specification of dynamics - the KSD Principle - every intensive emotion should control different expressive movements (Stranger and Hommel, 1996).

The aim was to try, in accordance with Baron's (1981) suggestion, to establish a psychophysical function between a biophysical specification and the information used by a perceiver to recognise various expressions of emotion. In other words, in his view, analyses of social knowing should begin by specifying the possible stimulation-based informational support for a given social judgement. In this instance, it is anticipated that the transformations in the light will be informative about other's

emotional states. Such an approach offers not only an opportunity to classify physically functional components of emotional behaviour, but also facilitates further investigation into the psychological meaning embodied in such expression. This has relevance to Darwin's (1872) argument for the evolutionary significance of the "communication" of emotion, and the cross-cultural emotion-recognition data gathered by Ekman et al. (1972) and Izard (1971). In line with Reed's (1996) view concerning the ecological stance, psychological states would be brought into the natural domain by emphasising the reality of the content of the available kinematic information.

Implications of the Study

In the event of this research validating Ginsburg and Harrington's (1996) notion that there are coherently organised patterns of action that reliably indicate and discriminate among emotions, justification will have been given to exploring many relevant and far more complex issues than involved here. This would also have considerable bearing on the psychological meanings embodied in others' experiences of witnessing such expression. Positive findings may shed light as to why we so often explain our degree of accurately perceiving others' emotional states as being dependent on intuitive skill.

METHOD

It was decided that a broad comparison of spontaneous expressions of emotion and emotion-related states was the most appropriate starting point for investigation, so the first task was to collect as diverse a selection of such events on videotape as possible. This involved an extensive search through news events, documentaries, historical material, television and film “bloopers”, and amateur home video collections. A total of 140 events were collected over a 6-month period.

Each analog clip of an event was digitised so as to facilitate control of image size of the expresser of an emotion, and cropping irrelevant material whenever this was required. A red arrow was included at the beginning of each, showing observers which individual to attend to while viewing the displays.

All events were then recorded onto two videotapes, in two orders, one the reverse of the other, each event separated by a countdown and participant response period as described in the test procedure which follows. The events were ordered randomly. No sound accompanied any of the displays.

Twenty-two emotion and emotion-related states perceived by several observers of the events were listed on a sheet, with the most unambiguous definitions available from a selection of dictionaries entered alongside. The purpose of the definitions was an attempt to ensure that all participants applied the same meanings to each emotion or emotion-related category when viewing each display. Preliminary test trials showed that listing these categories alphabetically made the

task too difficult as it was necessary to scan the entire list before indicating categorisation within the displays. As these trials revealed, observers tended to search the list for related categories such as anger and rage, embarrassment and shame. Consequently, related categories were listed adjacent to one another.

FULL VIEW STUDY

PARTICIPANTS

Participants volunteered in response to direct and e-mail invitation (see Appendix 1). The opportunity to go into a draw for a CD to the value of \$40.00 was offered as an added incentive.

Thirty-three psychology students, 24 female and 9 male, attending the University of Canterbury, Christchurch, New Zealand, took part in this pilot stage of the investigation.

APPARATUS

All displays were shown through a 3M Data Projector. The image size on the screen measured 1.35 metres wide and 1.00 metre high. The range of eye-to-screen distances was 1.05 to 5.4 metres.

PROCEDURE

On arrival, participants in groups ranging from 4 to 12 were welcomed and each given a copy of the information sheet (see Appendix 2), an emotion list (see

Appendix 3), a slip for the CD draw (see Appendix 4), and asked to seat themselves at computer stations. Approximately 5 min were then spent going over the information sheet and the rubric associated with the task, in an attempt to ensure understanding and allow the opportunity for any questions concerning the task and procedure.

The participants' attention was then directed to the list of 22 emotions and emotion-related states with definitions. It was requested that they read through these carefully to enable them to recall meanings when entering their responses. It was demonstrated how they would find the emotion categories to choose from listed in the same way on each trial down the left-hand side of their computer screen.

Next, a description of the visual countdown from 5 to 1 secs, with a low tone sounding on 5 and a higher tone on 2 was given. The participants were asked to attend to this tone as it signaled to them that the next display was about to be shown. Each of the displays was shown only once, and participants were requested to refrain from entering responses until after viewing the whole display. A period of ten sec would follow, to allow ample time for responses to be made. It was emphasized that the task was to indicate first and foremost the dominant emotion perceived followed by other emotions they might also have detected. It was demonstrated how each response required one left mouse-button click with the cursor on the appropriate screen button to indicate which emotion(s) and/or emotion-related state(s) they perceived as well as their confidence in each judgement on a scale of 1 (low) to 7 (high) for each display (see Figure 1). The procedure to follow for correction using the error box was explained also, in the event that participants accidentally indicated a different emotion from that which was perceived. If participants failed to detect any emotion they were asked to click on the NEXT button and prepare to watch the

following clip. It was demonstrated how the video clip number indicated on the top right of their response screens would always coincide with the number called out by the experimenter. The importance that participants watch this closely and immediately report if these differed during any stage of the test was emphasised.

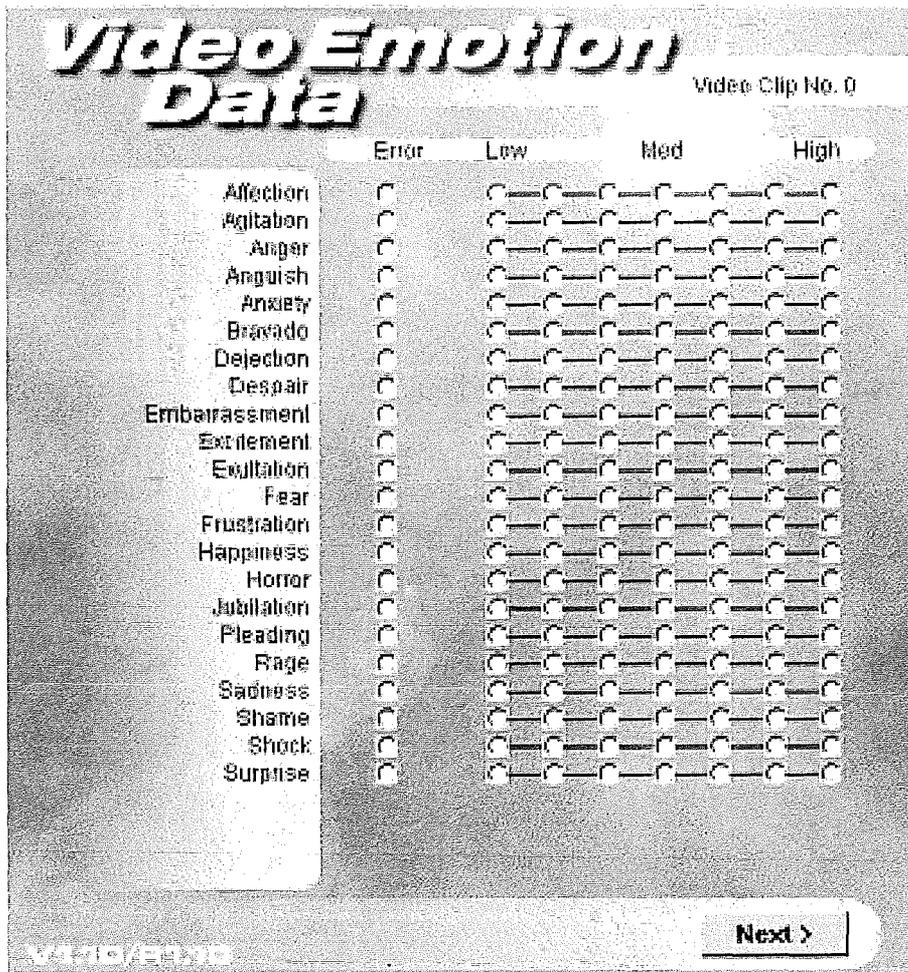


Figure 1. Computer response screen as used for both Full View and Point-light studies.

Approximately 10 min were then given to explaining the task, by using examples. After ensuring participants were viewing the correct response screen the lights were dimmed, an example was shown, and three trial displays followed which participants responded to. At this point it was checked that everyone understood and had followed through the task successfully. Once the participants were familiar and

comfortable with the requirements of the task, the actual test video was initiated. The entire task took no longer than 40 min to complete.

On completion of the task participants' questions were answered, appreciation was extended to all for their valuable contribution to this investigation, and the slips of paper for the CD draw were collected into a container.

The draw for the CD was carried out following the completion of this part of the investigation.

PREPARATION FOR THE POINT-LIGHT STUDY

The most reliable events shown in the full view study were identified through analysing participants' responses to the events observed. Fifty-five events were converted to point-light displays in order of the mean confidence ratings, ranging from 6.92 to 4.38 for the most dominant emotion or emotion-related category perceived. An additional four of those rated less reliably. (Events 37 (4.32); 4 (4.08); 55 (3.77); and 27 (3.77) were also converted to point lights.)

The conversion process from full view to point-light was arduous and time consuming, often requiring 2 to 3 hr to transform 1 sec (at 25 frames) of video footage into the point-light displays. Frame by frame, a white spot was painted on the forehead, each of the shoulders, elbows, wrists, middle of the fingers, hips, knees, and heels of one person, and the background then completely blacked out. These frames were then converted back into video form, resulting in point-light displays. This procedure was carried out through the use of Adobe Photoshop 4.0 computer program. For a detailed description of this process please refer to Appendix 5. In total, 56 different expressers were used in this study. Events 5 and 39 show the

same expresser within the same situation, although each event displays a different segment of this behaviour. The above applies also to Events 9, 18 and 55.

All point-light displays of the events were then recorded in forward and reversed orders across videotapes, each pair of events separated by the countdown and participant response period as described in the point-light test procedure that follows. Brief descriptions of each event, with duration times, are listed in Appendix 6. The particular order of events given there was presented to only 2 of the 24 groups participating in the point-light study. Once again, the displays were randomly ordered, and no sound accompanied them.

Only the 15 emotion categories perceived as reliably expressed by participants in the full view study were listed in differing orders on two response screens and two sheets, with the same definitions entered alongside (see Appendix 7). The reason for alternating between the two list orders was to counteract the possibility that the order of the emotions as listed on the sheets could influence participants' responses to the point-light displays in some way. Extra attention towards preventing such occurrences seemed particularly important for this part of the study as so much less information would be available for participants to respond to than was available in the full view displays.

Outline of Events as shown on the accompanying CD-ROM

The **CD-ROM** accompanying this thesis shows 27 of the events used for this investigation. For each, the point-light condition is repeated 3 times, followed by one

display showing the full view. There are 7 files as outlined below. Each Event is listed in order of presentation on the CD-ROM.

Anger file

Events 39, 24, and 7. These first three events are examples of displays within which emotional expressions were consistently detected for both conditions.

Events 32, 54, and 46 are analysed within the discussion section of this paper.

DespairEmbarrassment file

All four *Events 18, 9, 37, and 12* are analysed within the discussion section.

Excitement file.

Events 42, 34, and 4 are also analysed within the discussion section.

Fear file

Events 1, and 50 are examples of displays within which emotional expressions were consistently detected for both conditions.

Events 16, and 31 were not so well perceived. All four events are mentioned briefly within the discussion section.

Happiness file

Events 6, 48, 8, 19, and 41 show displays within which emotional expressions of happiness were detected.

Events 6, and 8 are examples of displays within which happiness was consistently detected for both conditions.

Perceptions of happiness within events 48, 19, and 41 were particularly strong for the full view display.

Event 41 is mentioned within the discussion section.

HappinessAffection file

Each of the *Events 44, 40, and 21* are analysed within the discussion section.

SurpriseShock file

Events 14 (shock) and 35 (surprise) show displays in which differences have been consistently indicated in perception of these two seemingly quite similar emotion states.

POINT-LIGHT STUDY

PARTICIPANTS

A total of 106 participants volunteered in response to direct and e-mail invitation (see Appendix 8). 75 were female 31 male.

The majority were psychology students attending the University of Canterbury, Christchurch, New Zealand. (See Table 1, Appendix 9, for the numbers of participants who viewed each event in both conditions).

APPARATUS

All displays were shown through a 3M Data Projector. The image size on the screen measured 1.35 metres wide and 1.00 metre high. The range of eye-to-screen distances was 1.05 to 5.4 metres.

PROCEDURE

On arrival, participants in groups varying in number from 2 to 10 were welcomed, given a copy of the information sheet (Appendix 10) and asked to seat themselves at computer stations. Approximately 5 min were then spent going over this and the rubric associated with the task, to ensure understanding and allow opportunity for any questions concerning participation in the study.

It was then explained to participants that their task would involve watching a series of point-light displays. While being shown one frame from a video clip



Figure 2. Video frame shown to participants before point-lights were applied.

before point-lighting,(Figure 2) it was explained to participants that those they were about to see started as a selection of short video clips of people in various emotional states behaving spontaneously. The procedure for producing a point-light frame was explained, ending up with frames much like the *next* frame shown (Figure 3). These frames were then converted back into video form, resulting in the point-light displays

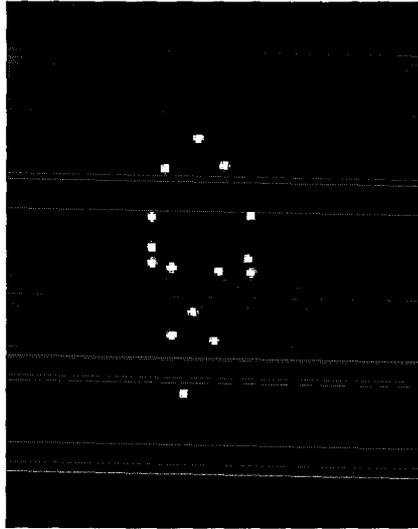


Figure 3. Same video frame as shown to participants after point-lights were applied.

they were about to see. It was pointed out that, consequently, the point-light displays are of *actual people* involved in *actual events* in the *real world*.

Following this, the task was carefully explained. A description of the visual screen countdown, from 5 to 1 sec, with a low tone sound on 5 and a higher tone on 2 to signal participants to attend to the upcoming display was given. Each of the displays was shown four times and participants were requested to refrain from entering their responses before viewing all repetitions. The importance of indicating first and foremost the dominant emotion perceived was emphasised, then others they may have detected also. A period of 10 sec would follow, allowing ample time for responses to be made. It was demonstrated how each response required one left mouse-button click with the cursor on the appropriate screen button to indicate which emotion(s) and/or emotion-related state(s) they perceived as well as their confidence rating in each judgement on a scale of 1 (low) to 7 (high) for each display The procedure to follow for correction using the error box was explained also, in the event that participants accidentally indicated a different emotion from that which was

perceived. If participants failed to detect any emotion, they were asked to click on the NEXT button and prepare to watch the following clip. No response would indicate that this is what had happened here. It was shown how the video clip number indicated on the top right of their response screens would always coincide with the number both called out by the experimenter and displayed to the right of the projection screen. The importance that participants watch this closely and immediately report if these differed during any stage of the test was emphasised. Participants' attention was then directed to the list of 15 emotion and emotion-related states with definitions. It was requested that they read through these carefully to enable them to recall meanings when entering their responses. It was demonstrated how they would find the emotion categories to choose from listed in the same way down the left hand side of their computer response screen. After ensuring each participant had the correct response screen in front of them, the lights were dimmed, an example was shown, and three trial displays followed to which participants responded. At this point it was checked that everyone understood and had followed through the task successfully. The test tape was then initiated, with participants responding to as many of the displays as the total time of up to 50 min allowed.

On completion of the task participants' questions were answered and appreciation was extended to all for their valuable contribution to this investigation.

RESULTS

Data reduction

Each participant's response for both the full view and point-light displays was transferred into a spreadsheet, one for each of the two conditions. On no occasion did a participant not detect any emotion in a display during the actual tests. The average confidence rating across participants for each emotion and each event was then calculated and entered into one spreadsheet with two columns (one full view, the other point-light) for each emotion corresponding to each event, one for each row.

Testing for patterns of relationship between participant perceptions of the full view and point-light displays

Correlations were computed between the average confidence ratings for the full view and point-light displays of each emotion category. As Table 2 shows, these are very strongly positive for the perception of jubilation, exultation, rage, excitement, frustration, happiness, anger, surprise, fear, agitation, shock, and embarrassment, $p < 0.001$. Affection, despair, and dejection ratings were also significantly correlated, $p < 0.05$.

Table 2.
 Pearson correlations between the average confidence ratings
 and proportion of variance accounted for for the full view and
 point-light conditions for each emotion category.

Emotion Category	r (X, Y)	r ²
Jubilation	.914***	.836***
Exultation	.854***	.728***
Rage	.830***	.690***
Excitement	.797***	.634***
Frustration	.771***	.594***
Happiness	.720***	.519***
Anger	.691***	.478***
Surprise	.658***	.433***
Fear	.638***	.407***
Agitation	.631***	.398***
Shock	.548***	.300***
Embarrassment	.472***	.223***
Affection	.290*	.084*
Despair	.277*	.077*
Dejection	.273*	.075*

* $p < 0.05$; *** $p < 0.001$.

Figures 4 to 21 (see Appendix 11 for Figures 10 to 21) illustrate the above relative to the emotions and emotion-related states participants perceived when viewing each of the events.

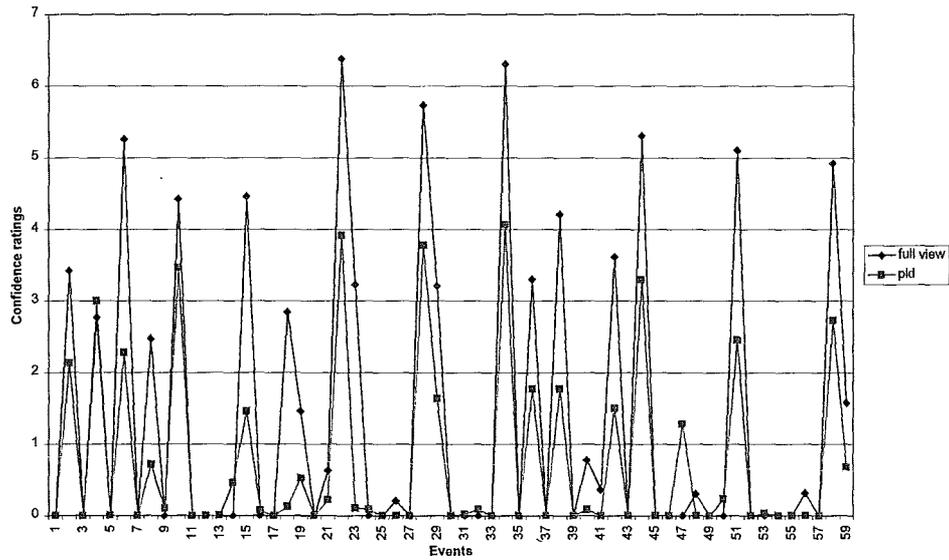


Figure 4. Line graph illustrating the correlation between the average confidence ratings of perception of **jubilation** across all events for the full view and the point-light conditions.

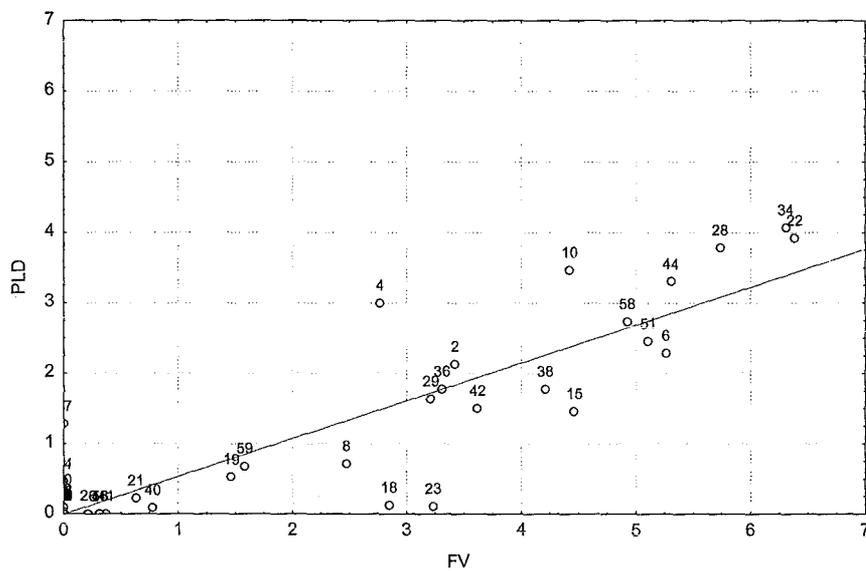


Figure 5. Scatterplot illustrating the correlation between the average confidence ratings of perception of **jubilation** across all events for the full view and the point-light conditions. Event numbers are shown beside the points plotted.

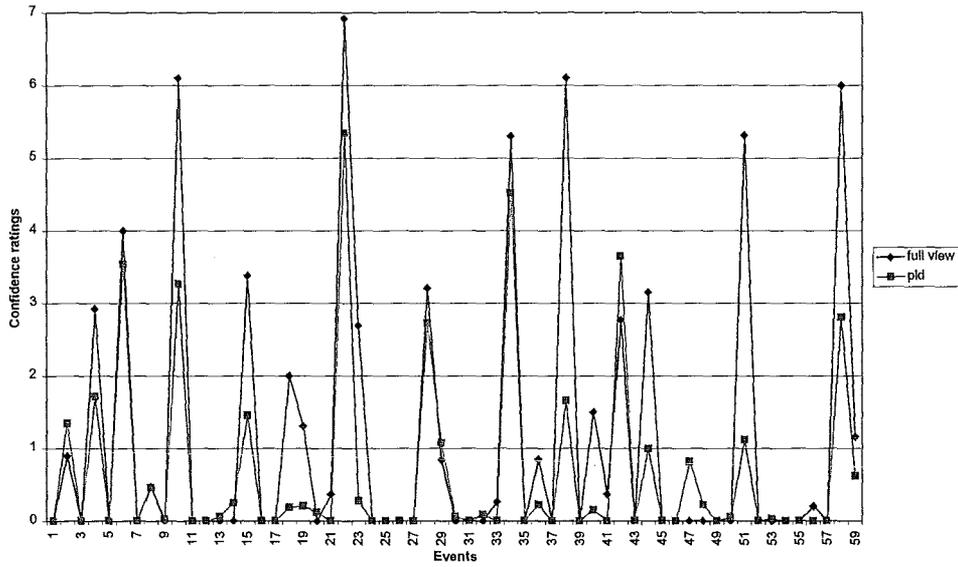


Figure 6. Line graph illustrating the correlation between the average confidence ratings of perception of **exultation** across all events for the full view and the point-light conditions.

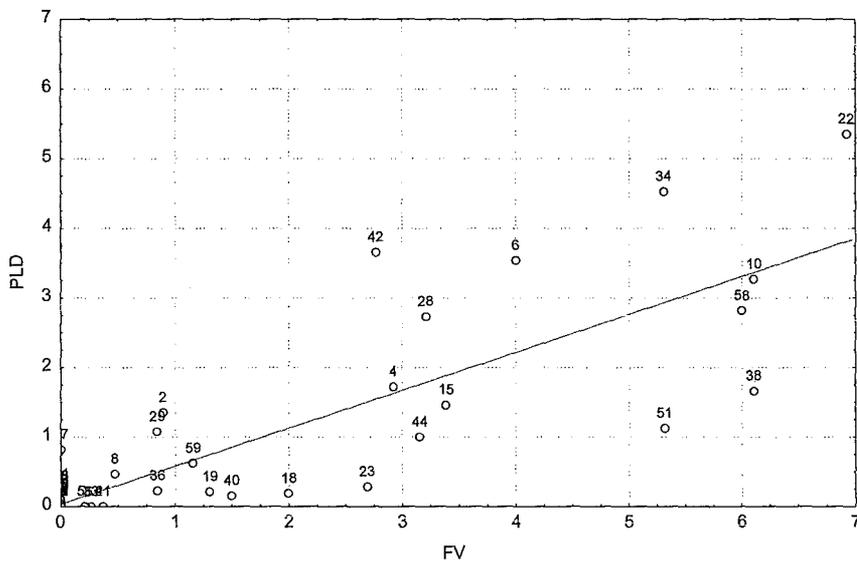


Figure 7. Scatterplot illustrating the correlation between the average confidence ratings of perception of **exultation** across all events for the full view and the point-light conditions. Event numbers are shown beside the points plotted.

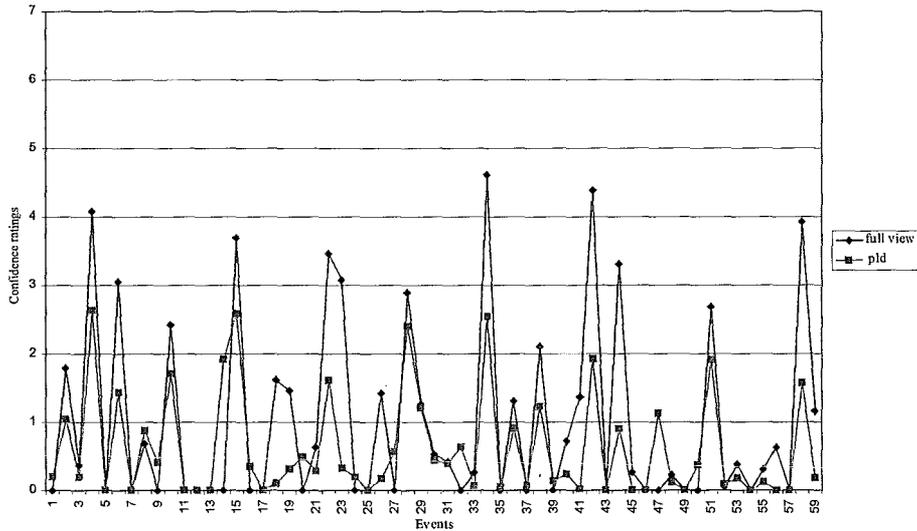


Figure 8. Line graph illustrating the correlation between the average confidence ratings of perception of **excitement** across all events for the full view and the point-light conditions.

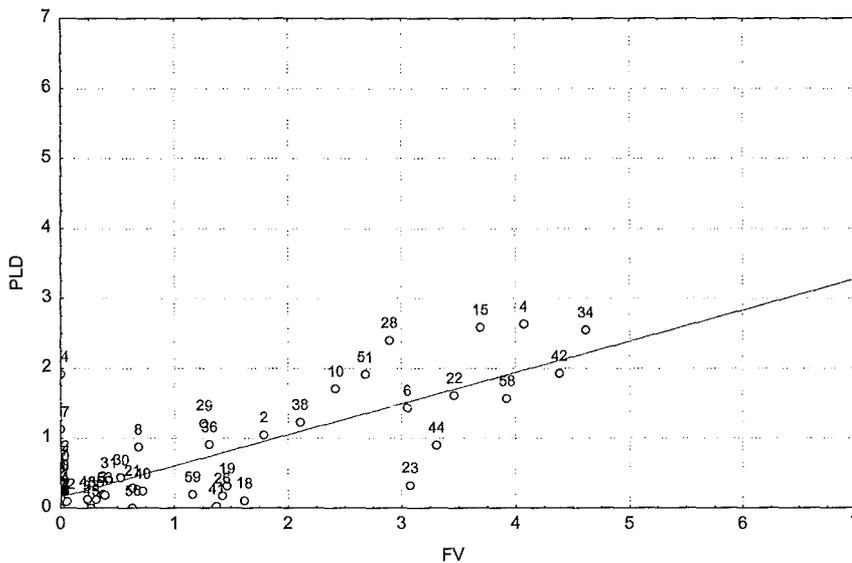


Figure 9. Scatterplot illustrating the correlation between the average confidence ratings of perception of **excitement** across all events for the full view and the point-light conditions. Event numbers are shown beside the points plotted.

The correlations range from highest for perception of jubilation to the lowest for dejection across all events. As is evident in Table 3, the mean confidence ratings for emotion perception are lower across the point-light displays than full view, with

the exception of despair and dejection. Furthermore, the mean confidence ratings indicative of perception of surprise, affection and shock are markedly lower across the point-light displays.

As the standard deviations show, there is generally a greater variability of confidence ratings for the full view condition than the point-light, most highly so for the perception of surprise, shock, and affection. Interestingly, this is not the case for despair and dejection. Variability of confidence ratings for the perception of these two emotion categories is greater for point-light observation.

Table 3. Means and standard deviations of confidence ratings for the Full View and Point-light conditions for each emotion category.

	Full View mean confidence rating across all events	Point-light mean confidence ratings across all events	Full View standard deviations across all events	Point-light standard deviations across all events
1.Jubilation	1.400*	0.748*	2.057*	1.210*
2.Exultation	1.155*	0.663*	1.946*	1.243*
3.Rage	0.689*	0.427*	1.454*	0.988*
4.Excitement	1.027*	0.615*	1.383*	0.774*
5.Frustration	0.594*	0.569*	1.251*	0.725*
6.Happiness	1.926*	0.728*	2.272*	1.087*
7.Anger	1.037*	0.640*	1.792*	1.014*
8.Surprise	0.858*	0.280*	1.572*	0.432*
9.Fear	0.737*	0.414*	1.506*	0.775*
10.Agitation	0.496*	0.404*	0.931*	0.502*
11.Shock	0.637*	0.255*	1.440*	0.407*
12.Embarrass	0.387*	0.265*	1.200*	0.390*
13.Affection	0.584*	0.226*	1.296*	0.312*
14.Despair	0.232*	0.486*	0.678*	0.872*
15.Dejection	0.117*	0.440*	0.469*	0.704*

Emotion categories 1-12 * $p < 0.001$, emotion categories 13-15 * $p < 0.05$

Correlations were then computed between the average confidence ratings among all emotion categories across all events for both the full view and point-light conditions.

The reason for computing these was to consider all possible pairs of categories to look for patterns in the data.

Patterns of clustering of emotion categories became evident as shown in Tables 4 and 5. These correlations involve both within-participant (e.g. judge an event to be excitement and jubilation) and between-participant (e.g. one judged the event to be excitement, another jubilation). Strong positive correlations exist for both the full view (FV) and point-light (PL) conditions for the following clustered pairs of categories: excitement-jubilation (FV $r = .91$, $p < 0.001$; PL $r = .84$, $p < 0.001$), excitement-exultation (FV $r = .85$, $p < 0.001$; PL $r = .77$, $p < 0.001$), excitement-happiness (FV $r = .65$, $p < 0.001$; PL $r = .42$, $p < 0.001$), jubilation-exultation (FV $r = .91$, $p < 0.001$; PL $r = .87$, $p < 0.001$), jubilation-happiness (FV $r = .69$, $p < 0.001$; PL $r = .54$, $p < 0.001$), and exultation-happiness (FV $r = .52$, $p < 0.001$; PL $r = .39$, $p < 0.01$); and for the cluster of agitation-anger (FV $r = .84$, $p < 0.001$; PL $r = .76$, $p < 0.001$), agitation - frustration (FV $r = .63$, $p < 0.001$; PL $r = .64$, $p < 0.001$), anger - rage (FV $r = .72$, $p < 0.001$; PL $r = .53$, $p < 0.001$); anger - frustration (FV $r = .72$, $p < 0.001$; PL $r = .78$, $p < 0.001$) and frustration-rage (FV $r = .39$, $p < 0.01$; PL $r = .59$, $p < 0.001$). The agitation-rage pair of categories significantly positively correlates only for the full view displays (FV $r = .63$, $p < 0.001$). The remaining positive correlations for both conditions are those between: affection-happiness (FV $r = .46$, $p < 0.001$; PL $r = .47$, $p < 0.001$); despair-dejection (FV $r = .66$, $p < 0.001$; PL $r = .79$, $p < 0.001$), noticeably higher for the point-light than full view condition); and surprise - shock (FV $r = .84$, $p < 0.001$; PL $r = .76$, $p < 0.001$). The correlation for the pair fear-shock is significantly positive for the full view condition alone (FV $r = .28$, $p < .0.05$).

There are no significant correlations between embarrassment and any other emotion category for the full view condition, yet several for the point-light displays. The positive correlations for the latter are embarrassment-fear (PL $r = .38$, $p < .0.01$),

embarrassment-despair (PL $r = .32$, $p < .05$), embarrassment-dejection (PL $r = .27$, $p < .05$) and embarrassment-shock (PL $r = .35$, $p < .01$)

Clusters of strong negative correlations exist for both the full view and point-light conditions also. These are: excitement - agitation (FV $r = -.39$, $p < 0.01$; PL $r = -.34$, $p < 0.01$), excitement - anger (FV $r = -.41$, $p < 0.01$; PL $r = -.31$, $p < 0.01$), excitement - frustration (FV $r = -.35$, $p < 0.01$; PL $r = -.37$, $p < 0.01$), jubilation - agitation (FV $r = -.37$, $p < 0.01$; PL $r = -.41$, $p < 0.05$), jubilation - anger, (FV $r = -.39$, $p < 0.01$; PL $r = -.36$, $p < 0.05$) jubilation - frustration (FV $r = -.33$, $p < 0.05$; PL $r = -.37$, $p < 0.01$), exultation - agitation (FV $r = -.32$, $p < 0.05$; PL $r = -.36$, $p < 0.01$), exultation - anger (FV $r = -.39$, $p < 0.01$; PL $r = -.29$, $p < 0.05$), exultation - frustration (FV $r = -.28$, $p < 0.05$; PL $r = -.32$, $p < 0.05$), happiness - agitation (FV $r = -.46$, $p < 0.001$; PL $r = -.39$, $p < 0.01$), happiness - anger FV $r = -.28$, $p < 0.05$; PL $r = -.36$, $p < 0.01$), and happiness - rage FV $r = -.39$, $p < 0.01$; PL $r = -.26$, $p < 0.05$). Significantly negative correlations between excitement-rage (FV $r = -.29$, $p < 0.05$) jubilation-rage (FV $r = -.31$, $p < 0.05$), and exultation-rage (FV $r = -.27$, $p < 0.05$) are evident only for the full view condition. In addition, affection-rage were significantly negatively correlated for the point-light displays only (PL $r = -.26$, $p < 0.05$).

Fear negatively correlates with excitement (FV $r = -.33$ $p < 0.05$), jubilation (FV $r = -.34$ $p < 0.01$), exultation (FV $r = -.29$ $p < 0.05$), and happiness (FV $r = -.42$ $p < 0.01$) across the full view, whereas for the point-light displays this emotion category correlates significantly negatively with jubilation alone (PL $r = -.28$ $p < 0.05$).

Table 4.

Pearson correlations between the average confidence ratings for the full view (above the diagonal) and point-light (below the diagonal) conditions for each pair of emotion categories (N=59 events). The lighter shading highlights significantly positive, whereas the darker indicates significantly negative correlations.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.Excitement	r (X, Y)	Full view	.906497***	.854628***	0.085354	.645132***	.328445	-.249518	-.185266	-.148293	-.252750	-.391378***	-.411645***	-.291351**	-.351258**	-.146462
		Point-light														
2.Jubilation	r (X, Y)	.836550***		.906921***	0.114839	.685734***	-.336902***	-.237361	-.167840	-.042036	-.287942*	-.369305**	-.394305**	-.305521*	-.325088*	-.156745
3.Exultation	r (X, Y)	.767879***	.867697***		0.071052	.520607**	-.293782*	-.206840	-.148990	-.160603	-.245955	-.321817*	-.344004**	-.267420*	-.2842257*	-.143331
4.Affection	r (X, Y)	0.024757	0.180917	-.048990		.460852***	-.234758	-.158229	-.106667	-.182838	-.204455	-.256578*	-.276324*	-.222111	-.220490	-.079394
5.Happiness	r (X, Y)	.423904***	.544278***	.385645**	.465300***		.419058***	-.292461*	-.205691	-.221227	.347073*	-.458892***	-.493391***	-.391620**	-.384703*	-.163379
6.Fear	r (X, Y)	-.209294	-.275157*	-.240211	-.244421	-.244421		0.231303	-.081397	0.115784	.279309*	-.065345	-.101405	-.084761	-.078833	-.132716
7.Despair	r (X, Y)	-.378346**	-.321382*	-.278165*	-.304498*	-.304498*	0.067152		.664701***	-.092572	-.056566	-.022921	-.065205	-.024542	0.01909	-.010491
8.Dejection	r (X, Y)	-.436862***	-.369041**	-.336669**	-.336590**	-.336590**	-.061643	.785614***		-.135420	-.111177	0.016454	0.033314	0.042429	0.042429	-.047418
9.Surprise	r (X, Y)	-.026600	-.171988	-.098879	-.172495	-.172495	0.071153	-.024429	-.086409		.836433***	-.184062	-.215726	-.191470	-.191470	0.160924
10.Shock	r (X, Y)	-.205748	-.302553*	-.240489	-.235624	-.235624	0.127659	0.232791	0.113949	.756216***		-.184062	-.215726	-.191470	-.191470	0.160924
11.Agitation	r (X, Y)	-.335474**	-.413806*	-.356065*	-.392308**	-.392308**	0.12712	-.042867	-.012186	0.057953	0.139711		.836311***	.630207***	.630207***	-.164589
12.Anger	r (X, Y)	-.306259*	-.361620*	-.291298*	-.361623**	-.361623**	0.067537	-.170301	-.078684	-.096270	-.080411	.757993***		.718121***	.718121***	-.183757
13.Rage	r (X, Y)	-.183197	-.240664	-.191764	-.256975*	-.256975*	-.150269	-.183131	-.165520	-.152336	-.077698	0.208399	.539579***		.390033**	-.152033
14.Frustration	r (X, Y)	-.371445**	-.390356*	-.319270*	-.407347**	-.407347**	-.095453	-.020235	0.022104	-.167135	-.056906	.636745***	.784415***	.589419***		-.152033
15.Embarrass	r (X, Y)	-.409602**	-.403713*	-.334613**	-.310543*	-.310543*	.381168***	.315488*	.266141*	0.088456	.346590**	0.131557	-.180297	-.243898	-.005178	

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 5.

Proportion of variance between the average confidence ratings accounted for the full view (above the diagonal) and point-light (below the diagonal) conditions for each pair of emotion categories (N=59 events). The lighter shading highlights significantly positive, whereas the darker indicates significantly negative correlations.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.Excitement	r^2 Full View	821736***	730388*8*	0.007285	416196***	107376*	0.062259	0.034324	0.021991	0.063883	53177**	169451**	084885*	123382**	0.021145
	Point-light														
2.Jubilation	r^2	699816***	822505***	0.013188	470231***	113503**	0.05634	0.02817	0.042036	082910*	136386**	155477**	093343*	105682*	0.024569
3.Exultation	r^2	589638***	752898***	0.005048	271032*	086308*	0.042783	0.022198	0.025793	0.060494	103666*	118338**	071514*	0.080802*	0.020544
4.Affection	r^2	0.000613	0.032731	0.0024	212385*	0.055111	0.025036	0.011378	0.03343	0.041802	065832*	076355*	0.049333	0.048616	0.006303
5.Happiness	r^2	179695***	296239***	148722**	216504***	175610***	085533*	0.042309	0.048942	120460*	210582***	243435***	153366**	147996**	0.026693
6.Fear	r^2	0.043804	076711*	0.057702	0.059742	0.059742	0.053501	0.006625	0.013406	0.078014*	0.00427	0.010283	0.007184	0.006215	0.017613
7.Despair	r^2	141637**	103287*	077376*	092719*	092719*	0.004509	441828***	0.00857	0.0032	0.000525	0.004252	0.000602	0.000364	0.00011
8.Dejection	r^2	190848***	136191**	113346**	113293**	113293**	0.0038	617190***	0.018338	0.01236	0.000271	0.00111	0.0018	0.0018	0.002248
9.Surprise	r^2	0.000708	0.02958	0.009777	0.02755	0.029755	0.005063	0.000597	0.007466	699621***	0.033879	0.046538	0.036661	0.036661	0.025897
10.Shock	r^2	0.042332	0.091538*	0.057835	0.055518	0.055518	0.016297	0.054192	0.012984	571863***	0.033897	0.046538	0.036661	0.036661	0.025897
11.Agitation	r^2	112543**	171235*	126782**	153905**	153905**	0.016159	0.001838	0.000148	0.003359	0.019519	699416***	397161***	397161***	0.02709
12.Anger	r^2	093795*	130769*	084854*	130771**	130771**	0.004561	0.029002	0.006191	0.009268	0.006466	574554***	515698***	515698***	0.033767
13.Rage	r^2	0.033561	0.057979	0.036773	066036*	066036*	0.022581	0.033537	0.027397	0.023206	0.006037	0.4343	294081***	152126**	0.023114
14.Frustration	r^2	137971**	152378*	101933*	165932**	0.165932**	0.009111	0.000409	0.000489	0.027934	0.003238	405444***	615307***	347414***	0.023114
15.Embarrass	r^2	167773**	162984**	111966**	096437*	096437*	145289**	099532*	070831*	0.007824	120124***	0.017307	0.032507	0.059486	0.000027

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Despair correlates negatively with happiness for the full view condition (FV $r = -.29$ $p < 0.05$) yet, clustered with dejection, indicates differences in the perception of these two emotion categories for the point-light displays for the following pairs: despair-excitement (PL $r = -.38$ $p < 0.01$), despair-jubilation (PL $r = -.32$ $p < 0.05$), despair-exultation (PL $r = -.28$ $p < 0.05$), despair-happiness (PL $r = -.30$ $p < 0.05$), despair-affection (PL $r = -.30$ $p < 0.05$), dejection-excitement (PL $r = -.44$ $p < 0.001$), dejection-jubilation (PL $r = -.37$ $p < 0.01$), dejection-exultation (PL $r = -.34$ $p < 0.01$), dejection-happiness (PL $r = -.34$ $p < 0.01$), and dejection-affection (PL $r = -.34$ $p < 0.01$).

Shock negatively correlates with jubilation for both the full view and point-light conditions (FV $r = -.29$, $p < 0.05$, PL $r = -.30$, $p < 0.05$), as well as with happiness for the full view (FV $r = -.35$, $p < 0.01$). Significant negative correlations are also evident for embarrassment paired with excitement (PL $r = -.41$, $p < 0.01$), jubilation (PL $r = -.40$, $p < 0.05$), exultation (PL $r = -.33$, $p < 0.01$), happiness (PL $r = -.31$, $p < 0.05$), and affection (PL $r = -.31$, $p < 0.05$) for the point-light displays.

There are no significant correlations, either negative or positive, between surprise and any other emotion category with the exception of shock.

We can see, then, that particular patterns of clustering of emotion categories exist within the data. Excitement, jubilation, exultation and happiness group together, as do agitation, anger, rage and frustration. Furthermore, these two clusters negatively correlate with each other. Despair and dejection seem to cluster together also for both conditions, correlating negatively with the excitement, jubilation, exultation and happiness cluster in

perception of emotion categories for the point-light displays. Perception of fear correlates positively with shock, negatively with excitement, exultation, and happiness for the full view displays, and negatively with jubilation for both full view and point-light conditions. Perception of shock also correlates negatively with happiness for the full view and point-light displays.

Column graphs were produced for each event for both the full view and point-light displays, particularly to identify those with high or low consistencies in perception of emotion categories from one condition to the other. Fourteen pairs of these graphs are shown here, as they seem most relevant for consideration within the discussion section that follows.

Event 54 (Figures 22 and 23) shows a male lashing out with a baseball bat at another male (off screen) during a road rage incident. In both conditions participants indicate strong perceptions of anger and rage, along with frustration and agitation. Confidence ratings are lower for the point-light display. The graphs illustrate some differences in perception of emotion and emotion-related states between the two conditions. Observers of the full view display detect some expression of dejection, fear, and surprise also, in contrast to the perception of shock by those viewing the point-light display.

Event 32 (Figures 24 and 25) is the shortest display for both conditions, lasting only 0.88 seconds. Participants perceive anger, rage, and agitation in both conditions while viewing this event. In this instance, fear is

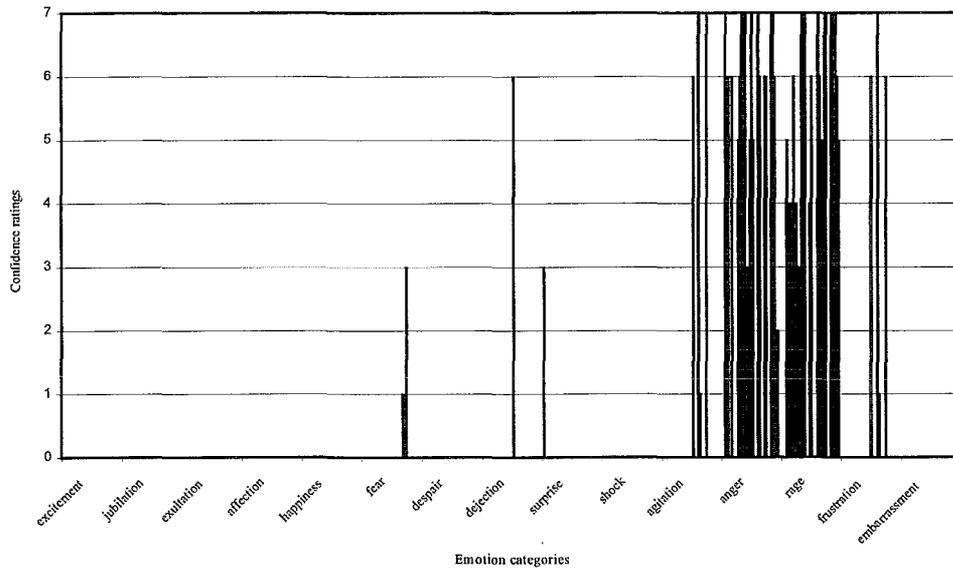


Figure 22. Column graph illustrating participants' perception of emotion categories when viewing Event 54 in the full view condition.

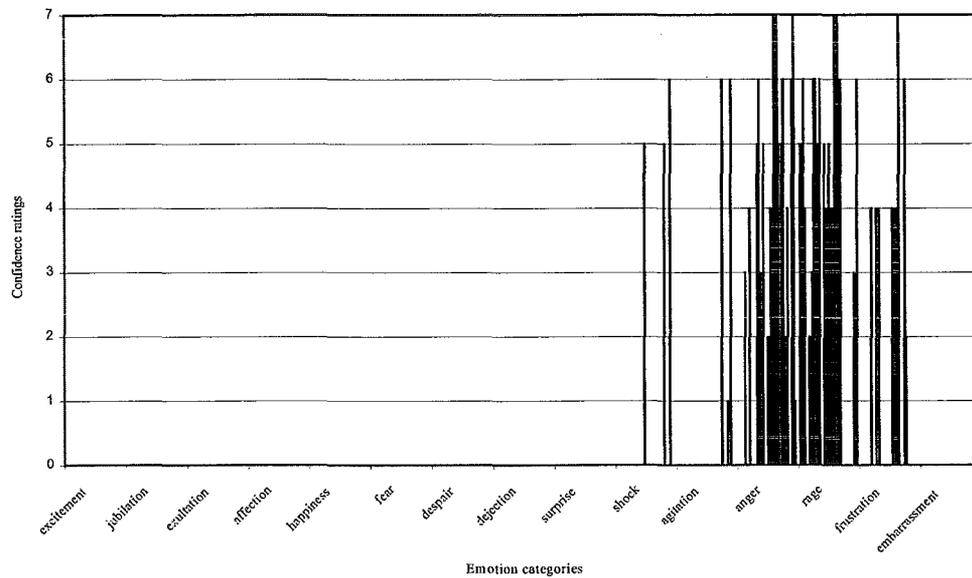


Figure 23 Column graph illustrating participants' perception of emotion categories when viewing Event 54 in the point-light condition.

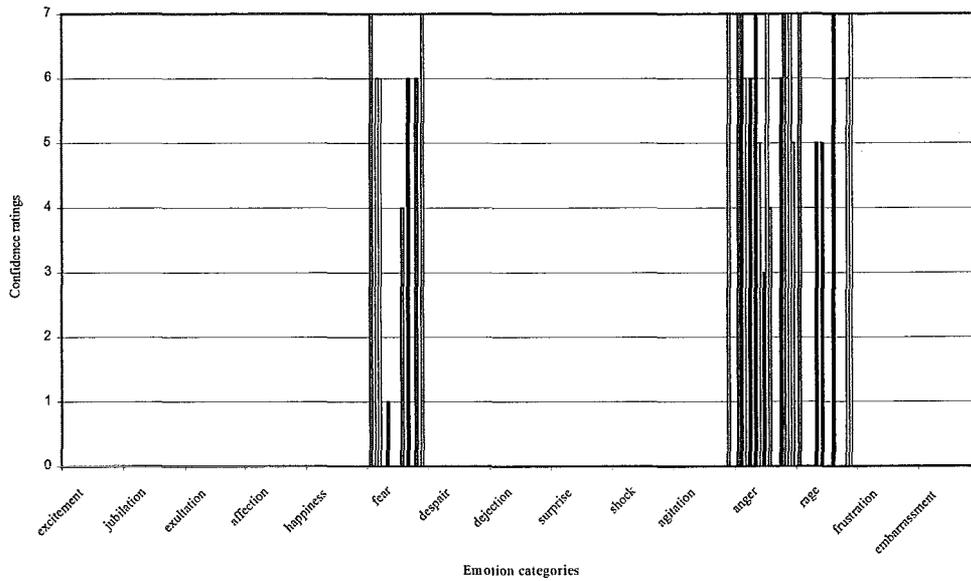


Figure 24. Column graph illustrating participants' perception of emotion categories when viewing Event 32 in the full view condition.

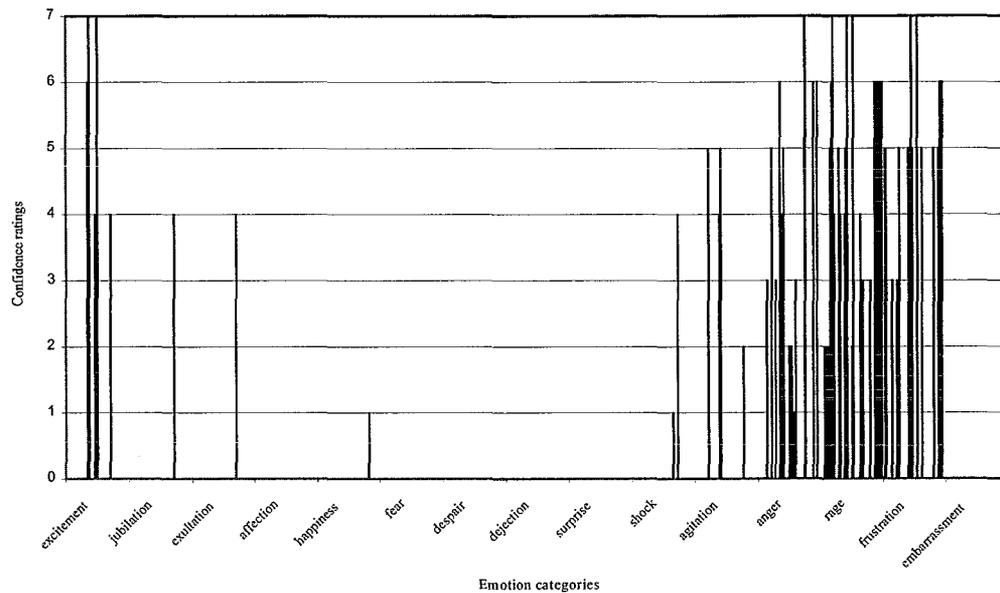


Figure 25. Column graph illustrating participants' perception of emotion categories when viewing Event 32 in the point-light condition.

also dominantly noticed only by those observing the full view display, whereas frustration and excitement are confidently detected within the point-light-display, along with some jubilation and exultation. We can see that confidence ratings are lower for the point-light display here as well.

Event 20 (Figures 26 and 27) shows a young man kicking a car during a riotous situation. Anger, rage, frustration, and agitation are confidently perceived for both the full view and point-light displays. Some perception of

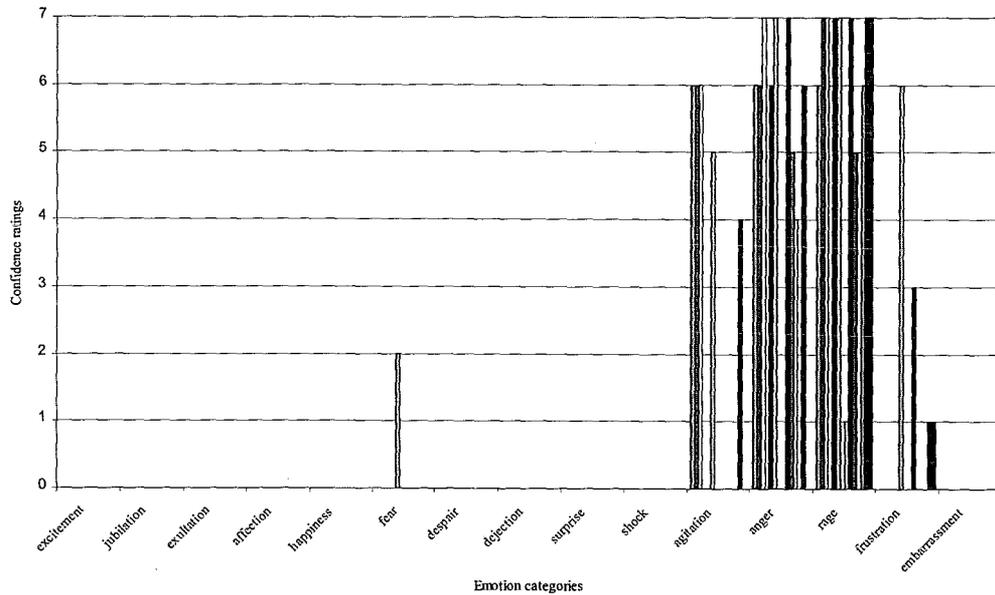


Figure 26. Column graph illustrating participants' perception of emotion categories when viewing Event 20 in the full view condition.

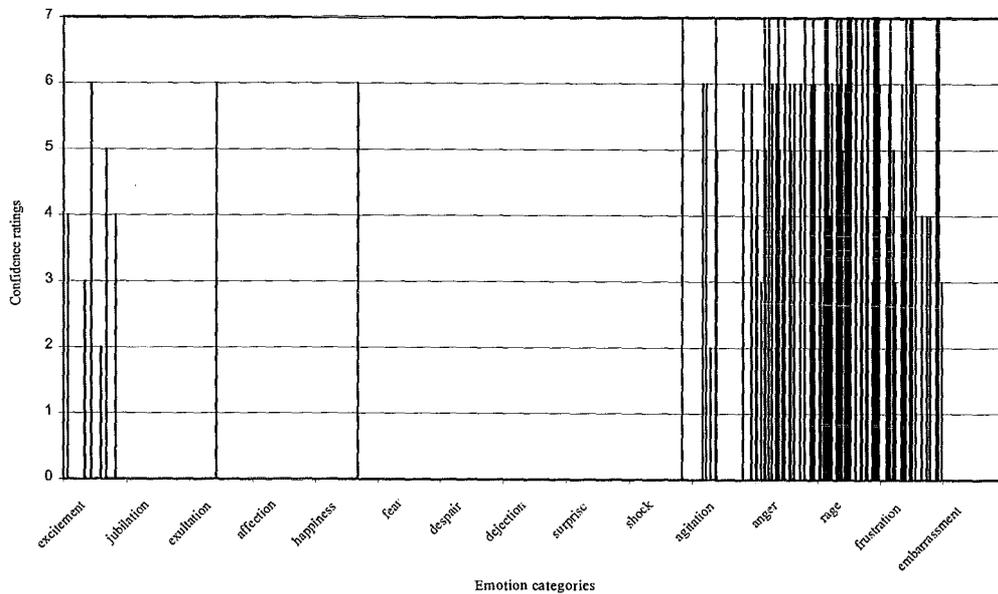


Figure 27. Column graph illustrating participants' perception of emotion categories when viewing Event 20 in the point-light condition.

fear is also evident within the full view condition. Observers of the point-light display noticed excitement also, accompanied this time by exultation and happiness.

Despite these variations in perception of emotion and emotion-related states through observation of the above events, we can see considerable

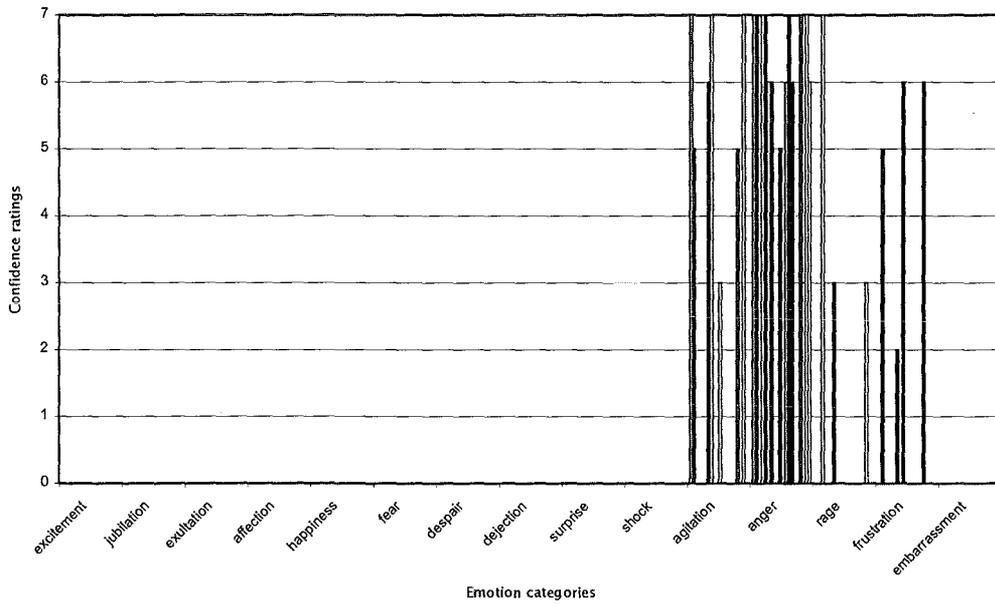


Figure 28. Column graph illustrating participants' perception of emotion categories when viewing Event 46 in the full view condition.

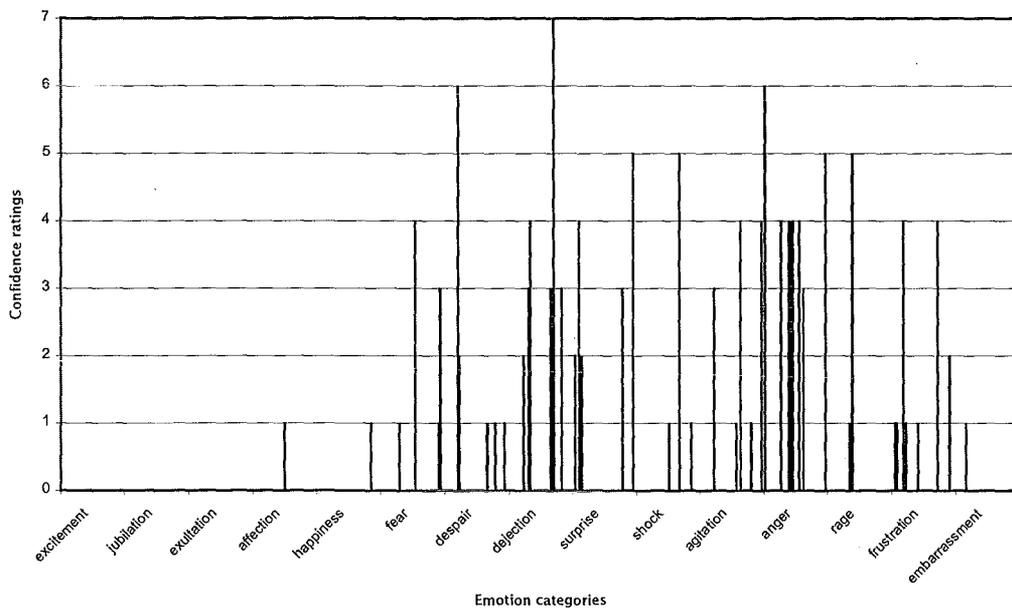


Figure 29. Column graph illustrating participants' perception of emotion categories when viewing Event 46 in the point-light condition.

consistency in these perceptions across both conditions. This seems particularly worthy of note, as these are examples of some of the briefest displays shown in this study.

In contrast to the examples shown above, perceptions of Event 46 (Figures 28 and 29) are far less consistent across the two conditions, even though expressions of anger, agitation, frustration, and some rage were confidently perceived by participants viewing the full view display. Furthermore, this event was of considerably longer duration (6.12 sec FV; 4.96 sec PL) than those previously illustrated. Event 46 shows a woman arguing with her neighbour. Initially she sits on a low fence, then stands and moves toward the other individual. It is important to point out, also, that the woman is wearing high-heeled shoes. Categorisation of the emotion is far more scattered and with less confidence for the point-light display, however. Anger, agitation, frustration and rage are perceived, though to much lesser degrees. Often, participants also indicate detection of dejection, despair, fear, surprise and shock. Detection of affection, happiness and embarrassment are also indicated, but the confidence ratings are so low one must question whether these are more indicative of uncertainty that any expression of emotion is perceived at all.

Event 21 (Figures 30 and 31) is interesting for a number of reasons. In this event a young woman is walking along a path affectionately linking arms with her boyfriend. Participants viewing the full view display confidently perceive happiness, and affection, along with jubilation, some exultation, and excitement. Quite different emotion categories are indicated as being evident within the point-light condition. Despair and dejection dominate with regard to this display, followed by much lower confidence ratings of perception of happiness. Accompanying perception of these is indication of every other emotion category offered other than exultation and rage. Some panning of the

every emotion category offered other than jubilation, exultation, and anger.

Confidence ratings are far lower for the point-light condition.

Participant responses were low for Event 40 (Figures 34 and 35) shown in the full view condition due to a fault in one of the videotapes across this particular display. Nevertheless, the data seems strong enough for consideration here. This event shows a sport spectator interacting with friends after a crucial goal has been kicked on the field. Expressions of exultation, affection, happiness, jubilation, and excitement are strongly perceived by participants observing the full view condition. This is not the case for the point-light display, though. Anger, agitation, and frustration are the dominant emotions perceived here. It is almost as if participants are divided, however, as happiness, affection, excitement, jubilation, and exultation are detected also. Confidence ratings are far lower and there is a vast scattering of emotion categories indicated.

Other groups of events particularly worthy of attention here are those involving the expression of embarrassment. Event 18 (Figures 36 and 37) shows a male's amateur attempts to perform on stage with "Manpower" (a male strip group). When more is revealed than he intends while removing his shorts, participants observing the (censored) full view display most strongly perceived embarrassment. Elements of excitement, happiness, jubilation, exultation, and affection are noticed also, along with surprise (and, possibly some fear). These additional emotions perceived are quite evident in the full view condition. There is no indication whatsoever of detection of excitement, jubilation, exultation, affection or happiness within the point-light display, however. The most strongly perceived emotion in this instance is fear,

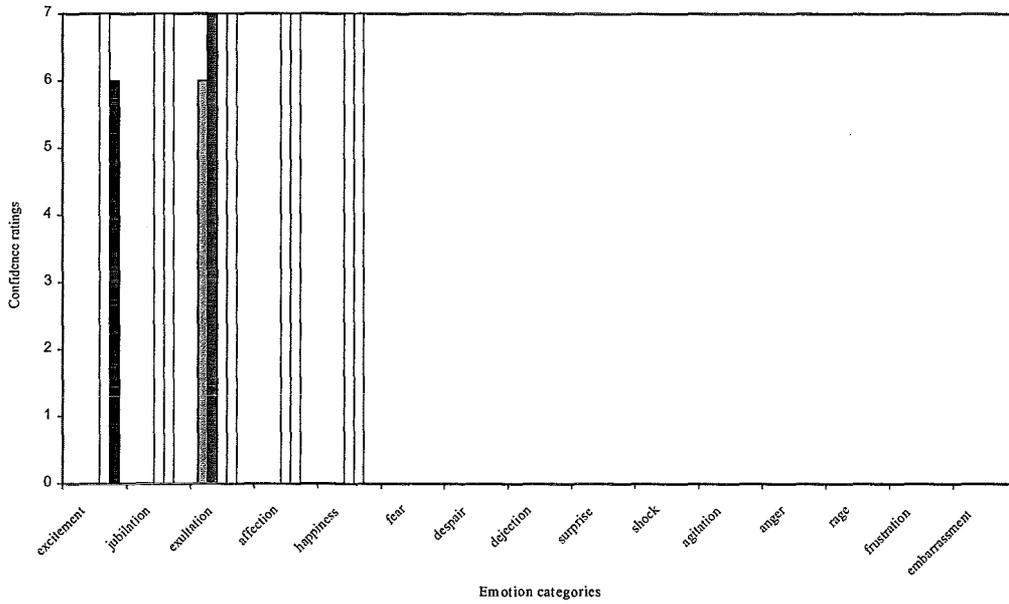


Figure 34. Column graph illustrating participants' perception of emotion categories when viewing Event 40 in the full view condition.

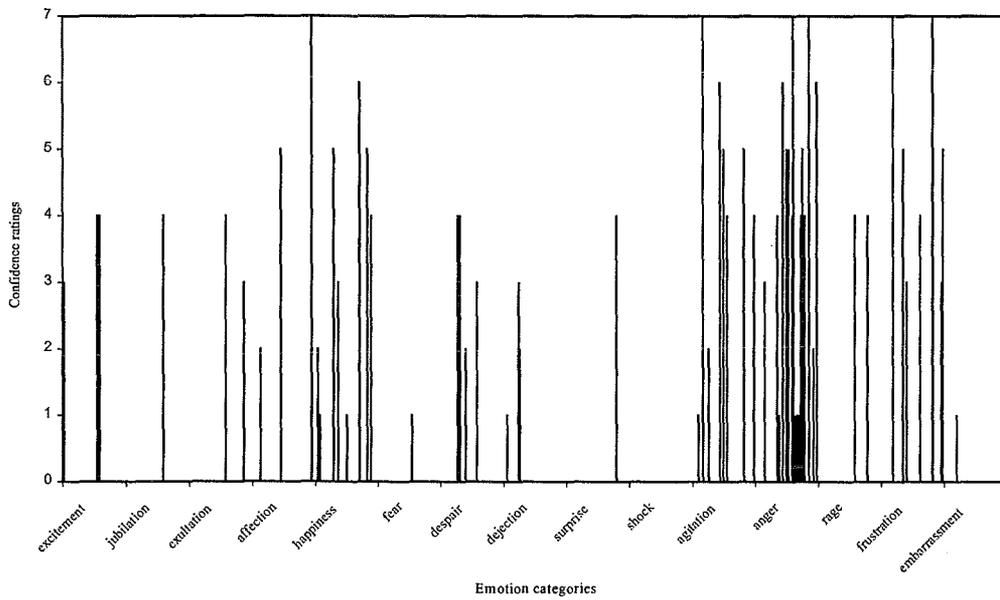


Figure 35. Column graph illustrating participants' perception of emotion categories when viewing Event 40 in the point-light condition.

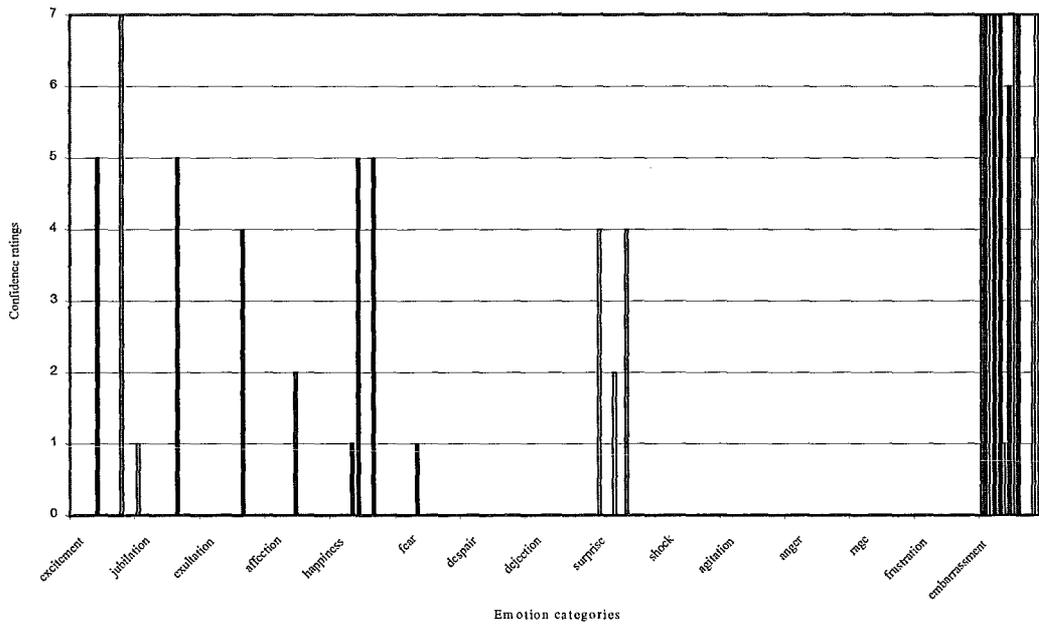


Figure 36. Column graph illustrating participants' perception of emotion categories when viewing Event 18 in the full view condition.

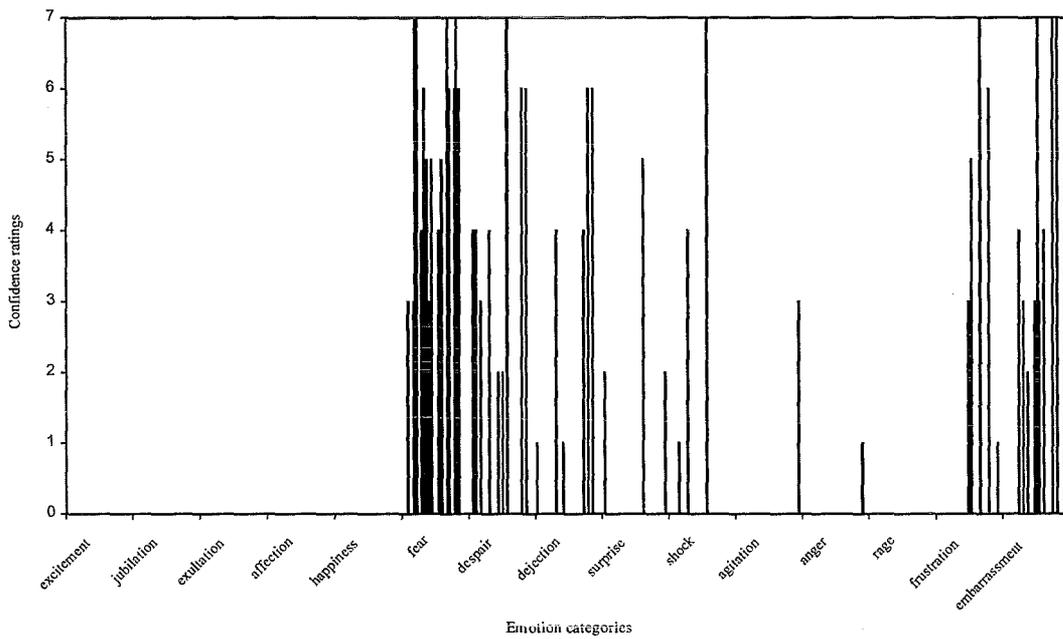


Figure 37. Column graph illustrating participants' perception of emotion categories when viewing Event 18 in the point-light condition.

followed most noticeably by embarrassment, despair, dejection, frustration, shock, and surprise.

A similar pattern is evident in participants' indications of emotion perception when viewing Event 9 (Figures 38 and 49), also. This event shows another segment of expression shown by the same male as follows in the same situation as Event 18. Participants watching the full view display indicate strong detection of surprise, shock, happiness, excitement, jubilation, exultation, embarrassment, and some degree of affection. Surprise and happiness are the most dominant emotion categories perceived here. In contrast, despair and dejection, as well as embarrassment, are most noticed by viewers of the point-light display. Surprise and shock, then frustration and agitation are also confidently reported. Comparatively little expression of happiness, excitement, jubilation, and exultation is detected.

Event 37 (Figures 40 and 41) is of related interest also. Here a female reporter accidentally drops the microphone she is using into the floodwaters at her feet. Once again, embarrassment is the dominant emotion perceived by those watching the full view display. Some happiness, fear, despair, dejection, surprise, and frustration is picked up also, but to lesser degrees. Participants observing the point-light display indicate despair and dejection as the most noticeable emotion categories expressed, followed by shock, embarrassment, some indications of perception of surprise, agitation, fear, as well as affection, excitement, and happiness.

Event 12 (Figures 42 and 43) shows a man at the top of a mountain discussing the likelihood that he will never see his family again. Those observing the full view display detect despair and dejection, along with some indication of agitation and frustration. While despair is perceived in the point-light display, embarrassment is indicated as being noticed also. Expressions

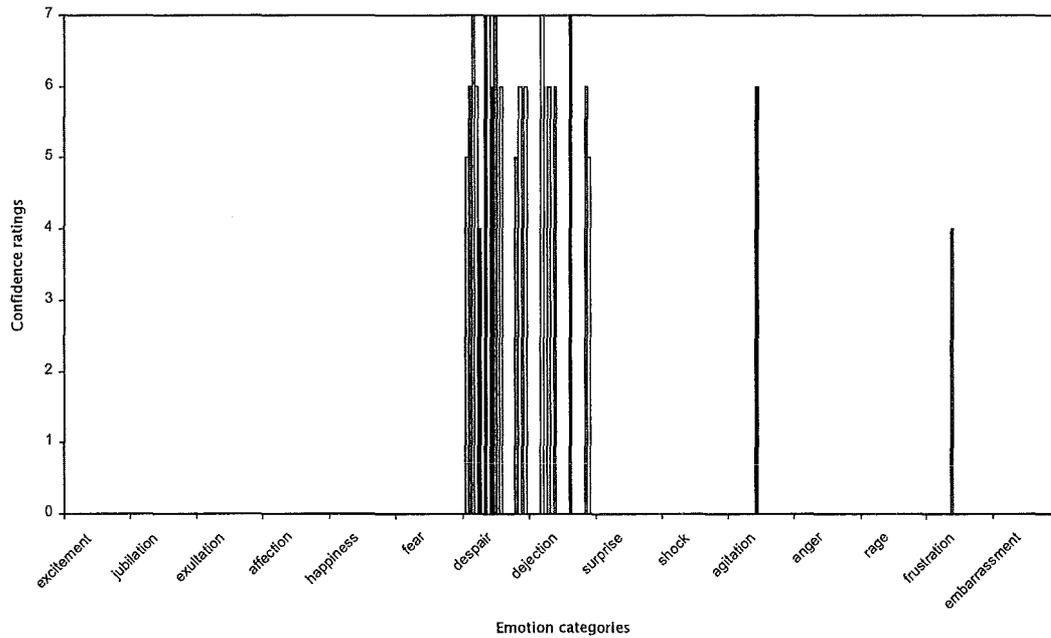


Figure 42. Column graph illustrating participants' perception of emotion categories when viewing Event 12 in the full view condition.

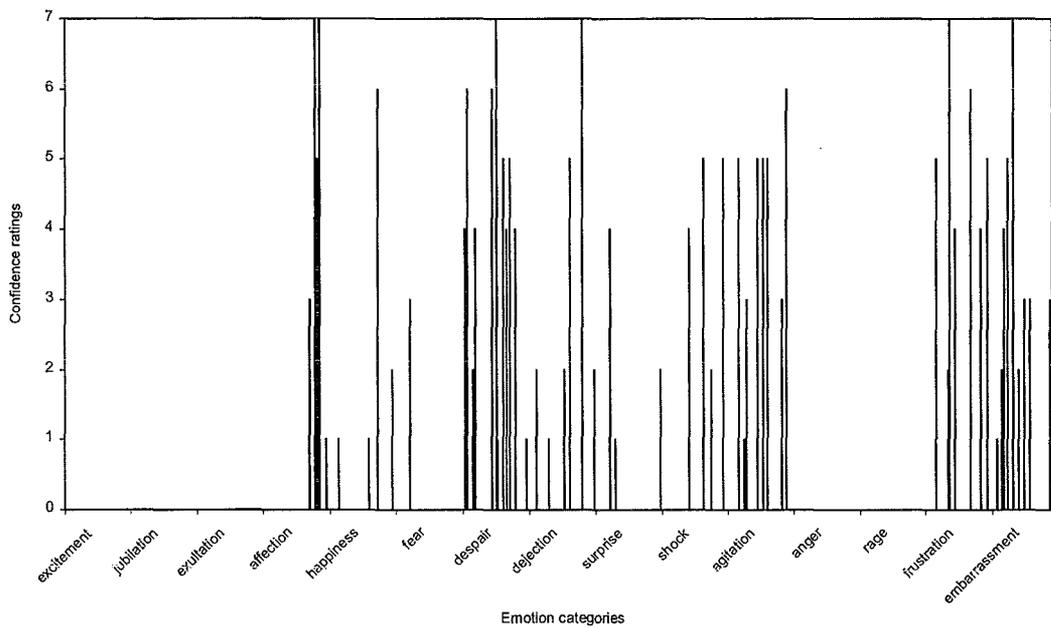


Figure 43. Column graph illustrating participants' perception of emotion categories when viewing Event 12 in the point-light condition.

The final group of events to be shown here is interesting to the extent that they demonstrate how, generally speaking, clustering of the same

emotion categories can be perceived across quite different situations. Event 42 (Figures 44 and 45) shows a young man involved in rioting and overturning a car. Participants observing both the full view and point-light displays dominantly perceive expressions of excitement, jubilation, exultation, and happiness, although in differing degrees. Indicated less often are those of anger, and rage, for both displays, as well as frustration within the point-light condition. The only other differences in categories noticed between these displays are affection (within the full view) and surprise (within the point-light). Event 34 (Figures 46 and 47) shows a sports player enjoying a victorious moment during a game of soccer. Participants for both conditions confidently report expressions of excitement, jubilation, exultation, and happiness. One participant indicates detection of slight embarrassment while viewing the full view condition, while another watching the point-light indicates noticing shock. Similarly, Event 4 (Figures 48 and 49), which shows a young boy leaping about on the playground in close proximity to his friends, is perceived as revealing expressions of excitement, jubilation, exultation, and happiness across both conditions. One observer detects slight embarrassment in the full view display, while participants viewing the point-light display perceive some evidence of surprise, shock, agitation, anger and frustration. As we have seen here, generally speaking, similar expressions of emotion categories have been perceived across quite diverse situations.

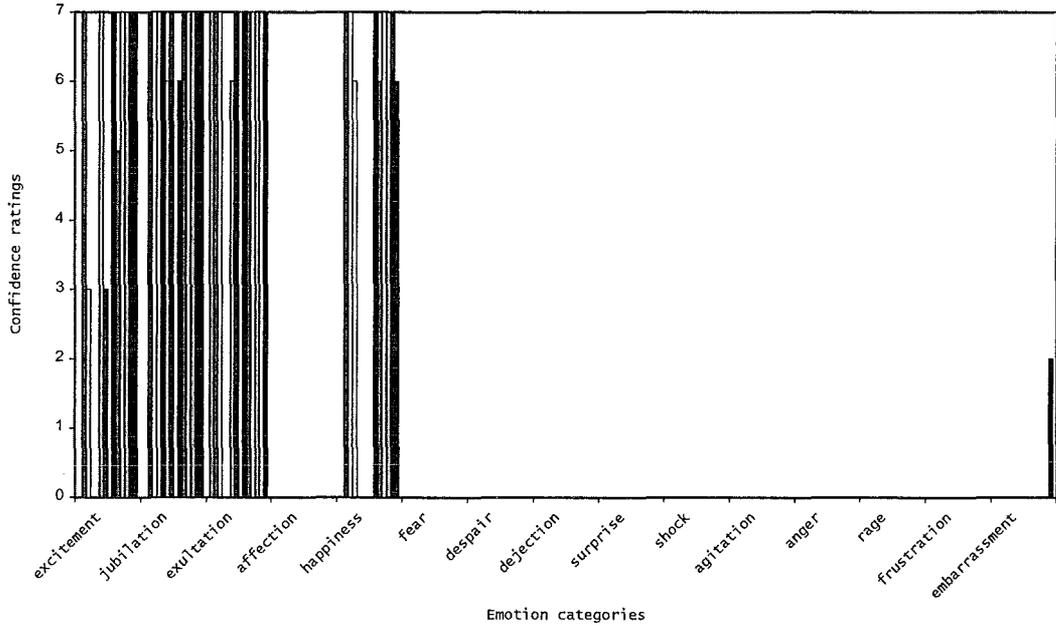


Figure 46. Column graph illustrating participants' perception of emotion categories when viewing Event 34 in the full view condition.

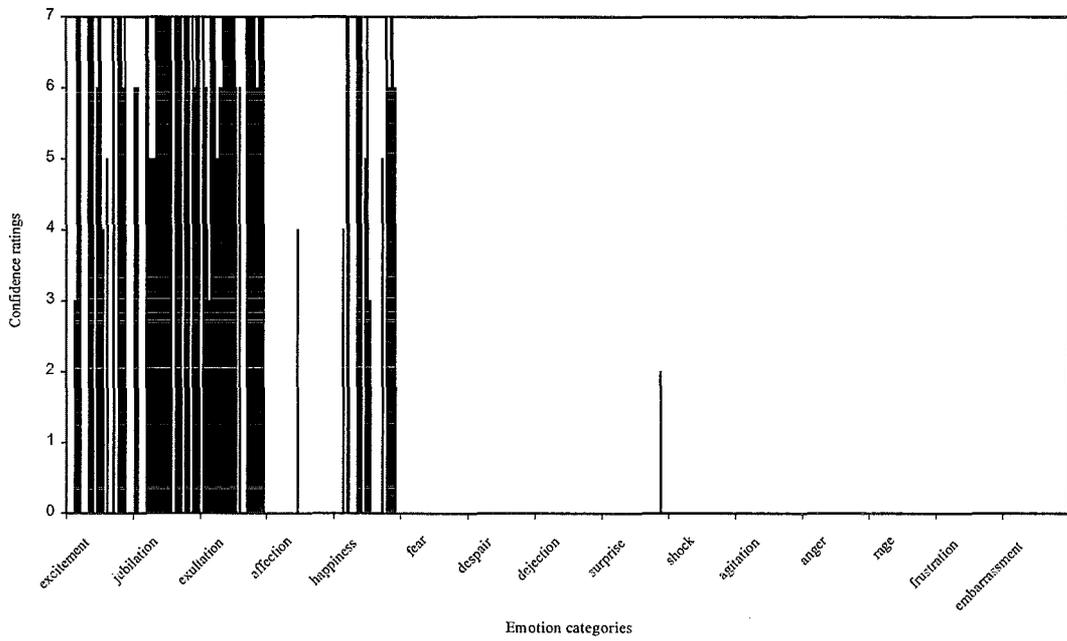


Figure 47. Column graph illustrating participants' perception of emotion categories when viewing Event 34 in the point-light condition.

DISCUSSION

The purpose of this investigation was exploratory. The main goal was to find out whether and, if so, to what extent, information about the expression of emotion and emotion-related states was preserved and perceivable across the two conditions, from the full view to the point-light displays. In the event that such information was acquired from these displays, the aim was then to look for specific patterns within the data. Consistencies or otherwise of emotion categories were studied also. Based on the findings here, an attempt is made to analyse and understand in ecological terms the temporal structure of the expressive and perceptive flow characteristic of emotional events as they unfold and change over time.

Patterns of relationship between participant perceptions of the full view and point-light displays.

Each of the 15 emotion categories offered to all observers shows significant positive correlations between the two display conditions for all events. Most correlate very strongly, while correlations with affection, despair and dejection are weaker. The degree of correlation indicates the extent to which the task-relevant information was preserved. Jubilation, exultation, rage, excitement, and frustration correlate most strongly, followed by happiness, anger, surprise, fear, agitation, shock, embarrassment, affection, despair and dejection. The correlation strength seems highest for those

events involving the most body movement evident within the point-light displays. The types of events for which emotion and emotion-related states were perceived most consistently were those detected as simultaneously displaying expressions of:

excitement, jubilation, exultation, and happiness (see Event 6, the 1st display shown in the Happiness file on the accompanying CD-ROM);

fear, when the individual was fleeing (see Events 1 and 50, the 1st and 2nd displays shown in the Fear file on the accompanying CD-ROM), rather than cowering down (see Events 16 and 31, the 3rd and 4th displays shown in the Fear file on the accompanying CD-ROM);

frustration, and anger (see Event 24, the 2nd display shown in the Anger file); and,

agitation, anger, frustration, and rage (see Events 7, 32, and 54, the 2nd through to the 5th displays shown in the Anger file on the accompanying CD-ROM). Within the latter group of events, the expressers wave their fists, point their fingers, kick, punch, and generally move about a great deal.

These results are consistent with the findings of Wallbott (1998), and indicate that the level of activation of body movements partly differentiates various emotion and emotion-related states. There are some similarities in the successive ordering of emotions between this study and Wallbott's findings. After testing to see whether different body movements and postures can be identified for a number of emotions, Wallbott found the highest movement activity was judged for elated joy, then hot anger. Happiness and fear rate more highly within the current findings, showing greater movement it would seem. Despair and dejection, on a par with sadness, show the least

movement activity. Ginsburg and Harrington (1996) discuss these differences in terms of intensity of the emotion state. A variety of physiological and behavioural characteristics are evident here. In Michotte's (1950) view, physical differences in movements such as speed are specific primitive impressions quite evident within the perceptual field. As he points out, such differences are quantitative, in that they distinguish the magnitude of emotion, rather than the kind.

The mean confidence ratings for perception of emotion in the point-light condition are generally lower than for the full view. This is particularly so for the affection, surprise, and shock categories. This is not unexpected however, since participants who observed the point-light displays had only one of the many sources of information available to those viewing the full view displays.

The generally greater variability of confidence ratings around the mean for the full view condition than the point-light is an expected result, also, for participants have impoverished information to attend to in the point-light displays. Once again, the general trend does not hold for despair and dejection. Participants' confidence ratings for events assigned to these two categories are more widely spread around the mean. Perhaps, through being forced to attend to information relevant to body movement alone, participants are picking up information relative to these two emotion categories that is overlooked by participants viewing the full view displays.

Patterns within the data.

The correlations of each emotion category with every other emotion category for both conditions reveal patterns of clustering of emotion and emotion-related states. Only significant correlations will be dealt with here. Two groups of emotions cluster together very strongly across both the full view and point-light displays: 1) excitement, jubilation, exultation and happiness; and, 2) agitation, anger, rage and frustration. The one exception here is agitation–rage, which positively correlated only for the full view displays. This can be explained, however. The correlations were far greater for rage than agitation. As rage seems to involve a great deal more body movement than agitation, it is not surprising, then, that these two emotion categories do not correlate across the point-light displays. It is of interest to note also, in view of this, that anger–frustration and frustration–rage are more strongly correlated across the point–light displays. Members of the two clusters – excitement, jubilation, exultation, and happiness versus agitation, anger, rage and frustration – correlate negatively with each other also, although to a lesser degree than the positive correlations within each cluster for both the full view and point-light conditions. Negative correlations between excitement–rage, jubilation–rage, and exultation–rage are evident only for the full view displays. High degrees of body movement evident in the point-light condition for each of these four categories may have led to some confusion here. Alternatively, there may be situations in which these apparently quite different emotion states were perceived as being expressed simultaneously by individuals displayed.

Affection correlates strongly and positively with happiness alone across both conditions. It seems that happiness expressed simultaneously with affection is perceived qualitatively differently from other occasions when its expression is associated with excitement, jubilation, and exultation. The crucial factor underlying this may relate to the type of event such expressions are perceived within. As Figures 6 and 13 show, happiness and affection are perceived as simultaneously evident within Events 13, 19, 21, 23, 29, 38, 44, 51, 58, and 59, most confidently for the full view displays. Each of these events shows the expresser relating affectionately with one or more individual. The sometimes considerably lower level of participants' confidence ratings in their perception of affection while viewing events in the point-light condition makes sense in view of the fact that the "other" the expresser is relating to is not explicitly represented within these displays. Evidence of proximity to another is often missing as well. As emphasised by Michotte (1950), the perception of the movement indicative of 'approaching' is connected with a definite object – that which the other approaches. Such information is not so readily available in the point-light condition. Furthermore, as Bassili (1976) suggests, some indication of the degree of temporal contingency between the movements of individuals within the displays seems necessary for perceiving interaction also. Event 44 (the 1st event in the HappinessAffection file on the accompanying CD-ROM), which shows a sport spectator interacting with friends, is an exception here. The other person the expresser interacts with is evident through being partly occluded by the former as the event temporally unfolds. This may explain the singularly higher confidence rating for perception of affection than happiness for participants viewing this particular

point-light rather than full view display. Despair and dejection correlate very positively for both conditions, yet more strongly for the point-light displays. Interestingly, despair only correlates negatively with happiness, and dejection shows no significant correlations with any of the other 14 emotion categories for the full view condition. There is considerable difference, however, in the perceptions of despair and dejection for the point-light displays. Both categories negatively correlate with excitement, jubilation, exultation, happiness, and affection here. Furthermore, the correlations are stronger for dejection. Perhaps this further supports the possibility that, through being forced to attend to information relevant to body movement alone, participants are picking up information relative to these two emotion categories that is overlooked by participants viewing the full view displays.

Fear positively correlates with shock for the full view condition alone, while negatively correlating with excitement, jubilation, exultation and happiness for the full view condition also. Fear only positively correlates with embarrassment for the point-light displays. Fear–jubilation is the only negative correlation for this condition also. Why fear correlates positively with shock only across the full view displays, and embarrassment alone across the point-light is puzzling. This lack of consistency suggests that the expression of fear may, generally speaking, stand alone rather than tending to cluster, as other categories seem to.

Surprise and shock correlate positively for both conditions, although more highly for the point-light displays. Shock and jubilation negatively correlate for both the full view and the point-light conditions, while shock and happiness negatively correlate only for the full view displays. There are no

significant correlations between surprise and any of the other emotion categories. Surprise and shock strongly positively correlate over both conditions yet only expressions of shock have been significantly differentiated during observation of the point-light displays. This suggests the possibility that some crucial differences between the expressions of surprise and shock are being perceived in the point-light condition. (See Event 14 (shock) and Event 35 (surprise) in the ShockSurprise file on the accompanying CD-ROM.) Perhaps the difference is that surprise can simultaneously be expressed with all the other emotion categories, whereas shock cannot.

There are no significant correlations between embarrassment and any other emotion category for the full view displays. However, this is not so for the point-light condition. Embarrassment positively correlates most highly with fear then with shock, followed by despair and dejection to lesser degrees. Embarrassment also negatively correlates with excitement, jubilation, exultation, happiness, and affection across the point-light displays. These results are most intriguing, and will be discussed at some length further on.

A brief overview of the correlations of each emotion category with every other emotion category across both conditions highlights some points that seem worth noting here. As demonstrated, these correlations reveal patterns of clustering of emotion and emotion-related states. Firstly, generally speaking, excitement, jubilation, exultation and happiness group together perceptually for both conditions, as do agitation, anger, rage and frustration. Shock and surprise, as well as despair and dejection (the related categories most reliably perceived beyond sadness in the full view study), positively correlate as two further clusters also. Fear, on the other hand, seems to stand

alone. These groupings of categories perceived across both conditions seem to fit well with the emotions most often considered “basic” or “primary”. In Ekman’s (1992) view “primary” or “basic” emotions can be distinguished due to their quick onset, brief duration, unbidden occurrence, recognition of triggering stimulus through almost automatic appraisal requiring minimal conscious analysis, universal antecedent events, distinctive physiological responses, and through their being accompanied by universally distinctive facial expressions and behaviours. Many studies have linked facial expressions to states of anger, sadness, disgust, fear, and happiness (see for example Ekman, 1973; 1992; Izard, 1993). Bassili (1978; 1979) used point-light displays of facial expression to find out whether expressive movements could be recognised through observation of these. Emotions were generally identified more accurately when lighting conditions for viewing were normal. However the emotions considered “primary” as listed above, and surprise also, were recognised equally as well through observation of the point-light displays. No events were found expressing disgust for this current study, so this emotion was unable to be included for investigation here. Nevertheless, each of the other emotions considered “primary” do seem to have been reliably perceived by participants in both conditions of this study, also. The excitement, jubilation, exultation and happiness cluster seems on a par with **joyfulness**; agitation, anger, rage and frustration with **anger**; despair and dejection with **sadness**; surprise and shock with **surprise**, and lastly, **fear** alone. The affection-happiness correlation is an exception here, as are correlations with embarrassment, perhaps as affection and embarrassment are not generally considered as “basic” emotional states.

Inconsistencies within the data

Participants' perceptions of the emotion and emotion-related states while viewing 14 selected events were shown graphically in the results section due to the value they offer to discussion here. Figures 22-23, 24-25 and 26-27 illustrate a high degree of consistency in the perception of emotion categories from the full view to the point-light condition, despite lower confidence ratings in detection within the latter displays. These are three of the shortest events shown, with Event 32 lasting only 0.88 seconds, Event 54 lasting 1.2 seconds, and Event 20 lasting 1.48 seconds (Events 32 and 54 are the 4th and 5th shown in the Anger file on the accompanying CD-ROM.) These results show that a great deal of relevant information is picked up in even very short displays. Possible reasons why discrepancies exist between sources of information in the two conditions will be given later within this discussion.

Figures 28-29 highlight inconsistencies in participants' perceptions of displays of Event 46 for the two conditions even though the emotive expressions are very similar to those shown in the figures mentioned just above. (This is the last event shown in the Anger file on the accompanying CD-ROM.) Furthermore, this display was of considerably longer duration (6.12 seconds for the full view, and 4.96 seconds for the point-light display). Why could this be so? Firstly, the fact that, initially, the expresser's body is not fully in view seems relevant. Even after she stands and the full body movement comes into view, there is something not quite "true". Closer examination of the full view display shows her heels unusually placed because she is wearing high heel shoes. The most noticeable difference

between the two displays, however, appears to be the lack of any indication whatsoever of the person she is interacting with. This lack of the "other" may have had some important impact here. Yet, as for Figures 22-23, 24-25 and 26-27, something further awaits explanation. There must be some relevance in the additional perceptions of dejection, despair, fear, surprise, shock, affection, happiness, and embarrassment indicated by those observing the point-light displays.

Event 21, categorisations of which are graphically illustrated in Figures 30-31, shows a young woman walking along a path, affectionately linking arms with her boyfriend. (This event is the 4th shown in the HappinessAffection file on the accompanying CD-ROM.) Major inconsistencies in detection of emotion states are evident between the two conditions. While participants viewing the full view display dominantly and confidently perceive happiness and affection, despair and dejection are most perceived by those viewing the point-light display. Some panning of the video camera during the filming of this event has probably contributed to the inconsistencies found here, but once again perhaps most particularly, this is due to the lack of detection of evidence of the other person the expresser is relating to within the point-light display. In this condition the woman appears to be lowering her head into her hands much as people do when expressing embarrassment or shame, when in fact she is snuggling towards and linking arms with her friend.

Figures 32-33 show a quite straightforward discrepancy between perceptions of the two displays. The full view depicts Event 41 (this event is the last shown in the Happiness file on the accompanying CD-ROM) showing

a seated woman laughing with friends. Participants viewing this condition confidently detect happiness as the dominant emotion expressed. However, it seems quite evident that happiness is perceived mainly through attention to her facial expression. The point-light display highlights this likelihood, due to the noticeable lack of body movement inherent within this display. There is little evidence suggestive of her happy state here, which seems to refute suggestions that perception of facial expression may not be a necessary component of emotion. Furthermore, this lends weight to Runeson and Frykholms (1983) and Berry and Zebrowitz-McArthurs' (1988) speculations that bodily kinematics provide only some of the information necessary for veridical perception of events. Consequently, uncertainty of the emotion categories perceived is reflected in the highly scattered classifications, with much lower confidence ratings.

Event 40, categorisation of which are graphically illustrated in Figures 34-35, shows a sport spectator interacting with friends following the kicking of a crucial goal on the field. (This event is the 2nd shown in the HappinessAffection file on the accompanying CD-ROM.) In contrast to the perceptions of exultation, affection, happiness, jubilation and excitement by those viewing the full view display, participants observing the point-light condition indicate anger, agitation and frustration as the dominant emotions they perceive. Once again, this is an example wherein information relative to the other people the expresser is interacting with may be difficult to detect. This, combined with disruption in the flow of his body movement when one of his friends slaps an arm around his shoulders, may contribute to the

confidence ratings for perceptions of emotion categories being far lower for the point-light condition for this event also.

Consideration of the above selection of events has highlighted various aspects of these that seem to account for inconsistencies across display conditions. These can be summarized as follows:

- 1) The extent to which the expresser's body is fully and uprightly shown within the display.
- 2) Lack of evidence of the "other" the expresser is emotionally interacting with.
- 3) Body movement "flow" of expression being interrupted or disrupted.
- 4) Less body movement due to emotion state being most evident through perception of facial expression of the expresser.
- 5) Panning of the camera, which produces unnaturally-flowing body movements.

As mentioned in the results section, another group of events particularly worthy of attention here are those involving the expression of embarrassment. Events 18 and 9 (shown graphically in Figures 36-37, and 38-39, consecutively) are of special interest here as they seem to shed light on the most noticeable differences in participants' perceptions of emotion when viewing the point-light displays. These events display two segments, sequentially, of expressions shown by the same male within the same situation. (Both events can be viewed on the accompanying CD-ROM, these being the first two sets of full view and point-light displays in the DespairEmbarrassment file.) When more is revealed than intended while removing his shorts during an amateur attempt to perform on stage with a

male strip group, participants observing the (censored) full view display of Event 18 most strongly perceive the expresser's embarrassment. As mentioned earlier, degrees of excitement, happiness, jubilation, exultation, and affection are detected also, along with surprise, and some indication of fear. Participants viewing the point-light display notice quite different emotion states, however. Members of this group strongly perceive fear, followed most noticeably by embarrassment, despair, dejection, frustration, shock, and surprise.

The full view display of Event 18 offers considerably more information. We can be aware of the context in which this event occurs, the nature of the activity, facial expressions, gestures, and directions of gaze not only of the expresser, but of the others he is interacting with also. The emotion categories perceived by those viewing this display are all quite evident here. The point-light condition tells a rather different story. Here we can be aware of one person alone, who most noticeably appears as frightened. As in other events indicative of this emotion, we can see the way the expresser moves his head as though looking anxiously in the direction of that which he fears. (See, for example, Events 1, 50, 16 and 31 in the Fear file on the accompanying CD-ROM.) Quite different emotion categories accompany this also – those of despair, dejection, frustration, shock, and surprise. Embarrassment may be evident through perception of the expresser raising his hands to his head, a gesture quite typical of this state (Miller, 1996).

The discrepancies between perceptions of these display conditions seem to be due to the attention devoted to the information within the displays. It seems the attention when viewing the full view condition is drawn to the

socially interactive level of communication evident within this display. While viewing the point-light, however, we can attend only to the patterns of bodily movement for this one individual and what these convey. Focus on the expresser alone at this particularly personal level alerts us to the likelihood that despair, dejection, frustration, shock and surprise may underlie the more social emotion state of embarrassment.

Event 9 immediately follows the expressions evident within those in Event 18. Interestingly, as these two events unfold successively over time, the emotion categories perceived shift quite dramatically, particularly for the full view display. Participants show far stronger, more confident detections of surprise and happiness here, as well as excitement, jubilation and exultation. One can only speculate at this stage the reasons why surprise is so strongly noticed here. Being so strongly associated with joyfulness suggests the “surprise” factor may indicate the expresser is pleasantly surprised to receive the support, encouragement, camaraderie and reassurance offered by others around him. Embarrassment is no longer detected to such a strong degree here. In marked contrast to perceptions of emotion while viewing this display, participants observing the point-light most frequently notice despair and dejection simultaneously with embarrassment. Indications of fear seem to have abated quite considerably, though. Surprise, shock, frustration, as well as some agitation and anger are perceived within this display also.

Once again, the full view display shows so much more, including the context, the nature of the activity, facial expressions and directions of gaze. We can see the encouraging way others push the expresser back towards centre stage, his gestures indicative of apology, as well as his seemingly

reluctant acceptance of acknowledgment by the crowd. Within the point-light display, some frustration, agitation, and anger is perceived, perhaps due to interference in the flow of the expresser's own body movements as he is pushed towards centre stage. As in Event 9, his hands go to his head, although more noticeably in this display. His movements seem slower and more hesitant also, which possibly accounts for the more frequent perception, particularly, of despair.

Figures 36 and 38, showing participants' perceptions of emotion states within each of the full view displays, illustrate a shift in detection of emotion states from embarrassment with some joyfulness and surprise perceived as being expressed simultaneously in Event 9, to less embarrassment and more surprise and joyfulness in Event 18. A similar study of Figures 37 and 39, illustrative of perceptions within the point-light displays, reveals a shift on the body kinematic level also. The dominant indication of fear in Event 9 gives way to higher levels of perception of surprise, most particularly, in Event 18. Furthermore, a degree of joyfulness, completely unnoticed in the former event, is also perceived in the latter display.

Figures 40-41 graphically illustrate participants' perceptions of emotion while viewing Event 37 in both conditions. (This event is the 3rd shown in the DespairEmbarrassment file on the accompanying CD-ROM.) Observers of the full view display, showing the reporter accidentally dropping the microphone she is using into the water, dominantly perceive embarrassment here also. In contrast, as before, despair and dejection are most noticeably perceived as evident within the point-light display. This further supports the suggestion made earlier that these latter two categories are

relative to the individually experienced emotional state of the expresser evident within these displays, which are noticed less frequently during observation of the socially interactive level of expression shown in the full view condition.

Event 12 seems an exception to this general trend however. (This event is the last shown in the DespairEmbarrassment file on the accompanying CD-ROM.) Here we see a man at the top of a mountain discussing the likelihood that he will never see his family again. Despair, dejection and fear are the most noticeable emotion states perceived within the full view display. As illustrated in Figures 42-43, those observing the point-light display also detect despair quite strongly. Interestingly, embarrassment is indicated as evident, despite none being picked up in the former condition. The raising of his hand to his face may explain this discrepancy in perception here. As noted before, this gesture typically accompanies expressions of embarrassment. All emotion categories other than excitement, jubilation, exultation, anger and rage were indicated as evident within the point-light display. Another factor most likely to have contributed to this confusion concerns the incorrect placement of the white spots during the conversion process of this event from the full view to point-light display. Spots were placed on the joint locations suggested by the thickly padded suit he wears, which led to ambiguity within the point-light condition. Indications of perception of affection are likely due to the placement of the spots suggesting the possibility that in fact the body movements of two people have been highlighted in this display.

Analysis of emotionally expressive events as they unfold over time

If we return to Events 18 and 9, we can see that these also afford a degree of analysis of the temporal structure of the expressive and perceptive flow characteristic of events as they unfold and change over time. Ginsburg and Harrington (1996) stress the fact that emotional displays do not simply spring into being. They consider the way such actions not only occur in a context partly due to prior events and processes, but also how these actions themselves are part of the context for the events that follow.

That the visible sequence of affective expression is determined not only by emotions, but also by display rules is an important point not to be overlooked here (Stranger and Hommel, 1996). These manners of communicating vary depending on the roles, settings and cultural contexts within which such expressions occur.

Safran (1996) has written a paper considering emotion in Cognitive-Behavioural therapy and treatment. He points out how, prior to the 1980's, so-called "undesirable emotions" were assumed to be produced by faulty thinking processes. The therapeutic emphasis was, therefore, on encouraging the control of emotion rather than facilitating its experience. Zajonc (1980) suggests affect is processed as part of experience. In light of Ginsburg and Harrington's (1996) ideas, though, it seems more accurate to consider affect itself as part of the experience.

Lazarus (1991) urges us to think of emotion in terms of the person-environment relationship, wherein the basic unit of this relationship is an *adaptational encounter*. He proposes, also, that these ongoing transactions

have a bearing on personal goals. He describes this encounter as being concerned with the realisation of these goals while, at the same time, managing the environmentally given demands, constraints, and opportunities. Such ideas fit well with E.J.Gibson's (1994) assertions that flexibility in responding to objects and events is a basic feature of behaviour. Safran (1996) encourages us to consider how emotions play an adaptive role in human functioning. In his view, emotions serve to safeguard the goals of the biological organism. He suggests fundamental goals such as self-protection, attachment and procreation are innate to the organism, while others, derived from these basic goals, develop through learning. The ecological view stresses action and awareness as achievements of an organism within its environment. As Reed (1996) explains, properties of animate activity and perception emerge through these encounters with surroundings.

Relating this specifically to the human experience, Reed (1996) draws our attention to the highly organised environment we grow up in, with the expectancy ever present that each of us will enter into not only our species' but also our family's, and our culture's particular patterns of interaction. Consequently, the form of our lives as human beings is essentially communicative. It is no wonder, then, that Baumeister and Leary (1995, p499) consider the human species as "naturally driven toward establishing and sustaining "belongingness." Considered in line with Safran's (1996) view, this describes a fundamental goal. A sub-goal developed as a result of learning, could derive from the knowledge individuals acquire about the ways they must be if they are to maintain relatedness or proximity to others. As Reed (1996,

p67) points out “our appreciation of our place in the world is based on the specificity of the information we pick up.”

Ittleson (1973) argues that the initial level of response we have to the environment is emotional. He proposes that this direct impact of the situation generally guides the direction of future relations with the environment also, and has the effect of narrowing the types of experiences we subsequently seek or expect. The idea that environmental stimulus could have such a strong affective impact is considered quite feasible by Zajonc (1980) also. He proposes the word *preferenda* as one that aptly describes this. In this sense, emotions may provide information about the way that the biological system is reacting to certain aspects of the environment. Emotion and emotion-related states can tell us something about our own and others' interactions within the world. For example, feelings or expressions of anger may tell us how we or other individuals are protecting ourselves.

Ginsburg and Harrington (1996) suggest that we consider both the social and personal functions afforded by emotion talk and emotion display. Through attending to the way such events unfold, meaningful information can be used to facilitate regulation of activity. As Warren and Shaw (1985) point out, the structure of affordances is likely to precede the structure of events. From the ecological viewpoint, the study of functional adjustment to the environment is fundamental to the process of psychology (Reed, 1996). In the event that Ittleson (1973) and Zajonc (1980) are correct in proposing that the initial level of response we have to the environment is emotional, Ginsburg and Harrington (1996) see no reason why this cannot be changed either by the individual or by the flow of interaction the individual is functioning within.

For example, the development of an outburst of anger may be facilitated or discouraged by others participating also within that interactive flow. We use actions to make such information available for others within this flow (Reed, 1996). Meaning is to be found in such experience. Ecologically speaking, as Young et al. (2000) explain, a script is considered in terms of the invariance detected across similar situations. They succinctly tie these ideas together when they say:

As the perceiving–acting cycle unfolds over time the intentions of the agent lead it towards a goal....Understanding the dynamics of the flow field of information and its relation to the perceiver (e.g. detecting invariance) is where an ecopsych description of cognition begins. (2000, p151)

A degree of affective impact may guide our attention to particular environmental or situational affordances. Safran (1996) contends that emotions can have such a compelling quality that they move us in a certain direction because they play a role in safeguarding important goals.

Consideration of these ideas with reference to Events 18 and 9 may be useful here. Findings from a study conducted by Parrott and Smith (1991) indicate that, generally speaking, people experience embarrassment when they have lost control of a situation, and their behaviour seems inconsistent, inappropriate, or incongruous to the people they are interacting with. The situation of the expresser in Events 18 and 9 seems to be a good example of such an occasion. While viewing the full view displays the expresser's facial expressions, gestures, and appealing directions of gaze are noticed. His efforts to apologize are obvious, along with the support, encouragement,

camaraderie and reassurance offered by those around him. Parrott and Smith (1991) continue, describing our responses to embarrassing incidences also. We have a tendency to try to explain ourselves, focus on the humorous side of the predicament, nervously ignore what has happened, or escape the situation through departure. Goffman (1971) further notes that deviations from common patterns of behaviour usually require an apology, excuse or explanation. Parrot and Smith (1991) noticed, also, the likelihood that others present may assist the embarrassed individual's efforts to recover through behaving similarly and supportively. In such a way, as Hargie et al. (1994) explain, nonverbal behaviour helps define acceptable patterns of behaviour across innumerable social situations. Although affordances tend to be viewed as possibilities for action, we see they can also be occasions for responsibility, as well as opportunities for virtue or vice (Hodges and Baron, 1992).

Lazarus (1991) questions how such an adaptational encounter could be defined, and notes the difficulties involved here. When an emotion state changes, this coincides with a change in the person–environment relationship. He concludes that both are as two sides of the same coin. Through attending to changes in emotional state, both individuals and those they interact with can perceive the extent to which everyone's goals are being achieved. Event 24 (the 2nd display in the Anger file on the accompanying CD-ROM) is a fine example illustrative of a situation in which, through attending to changes in the expressers emotional states, we can appreciate the extent to which goals are *not* being achieved. Here, the driver of the car, participating also within this interactive flow, is facilitating the development of an outburst of frustration

leading to anger. Such considerations lend weight to Ginsburg and Smith's (1993) conviction that "psychological states" of individuals are directly detectable. As they explain, we can see how such states are specified in temporally extended patterns of situated stimulation. As Young et al. (2000) propose, it is the interactions themselves that are best described as motivated.

The final group of events, shown graphically in Figures 44-45, 46-47, and 48-49, is interesting to the extent that these events, in particular, demonstrate how clustering of the same emotion categories can be perceived across quite different situations. (See these in the Excitement file on the accompanying CD-ROM.) Event 42 shows a young man involved in rioting and overturning a car; Event 34 shows a sports player enjoying a victorious moment during a soccer game; and, Event 4 shows a young boy leaping about on the playground close to his friends. Expressions of excitement, jubilation, exultation, and happiness are most strongly perceived by participants observing each of the events across both the full view and point-light displays. As expected, some detection of anger, rage and frustration is evident within Event 42. However, many participants give no indication that they have noticed these emotion states. It has been suggested by those who have viewed the point-light display for Event 4, that if one assumes this is showing the body movements of an adult rather than a child, it appears the individual may be throwing a temper tantrum. However, once again, only some participants indicated perceiving these. Putting these differences to one side for the moment, the high levels of confidence in the detection of the same emotion categories across these different situations suggest that there must

be some patterns within bodily action that reliably indicate between emotions. What these are is still difficult to say. As Stranger and Hommel (1996) explain, in accordance with the KSD principle, every intensive emotion should, as a physiological and emotional state, control the various movements of expression. Hopefully, time series analysis of the point light displays will shed some light on this. Meanwhile, out of curiosity, I joined the white spots from 22 consecutive frames of the point-light display for two of these events. Thus, the movement of the head and each joint has been tracked, resulting in a set of two-dimensional displays. Figures 50 and 51 show signs of a movement pattern common to all three. These are very quick, each lasting only a fraction of a second. Frijda (1969) asserts that different emotions can give rise to one and the same expression. No evidence has been found supporting this through observations of the numerous displays. That the same emotions can find expression in quite different situations is most interesting, however, particularly in relation to the notion that encounters in the world are able to somehow "trigger" us into seemingly inappropriate emotional states and behaviours.

Ginsburg and Harrington (1996) consider how component features of emotional events differ according to the situational affordances for action, and imply that the co-occurrence of displays, behaviours, and physiological reactions offer the conditions required for us to perceive a specific emotion or emotion-related category. Such categorizations afford social utility in the



Figure 50. Two dimensional display showing body movement pattern of Event 42 for 0.125 sec.



Figure 51. Two dimensional display showing body movement pattern of Event 4 for 0.20 sec.

conduct of human affairs. As Gibson (1979, p135; 1986, p42) so aptly describes:

What the other animal affords the observer is not only behaviour but social interaction. As one moves, so does the other, the one sequence of action being suited to the other in a kind of behavioural loop. All social interaction is of this sort -sexual, maternal, competitive, cooperative - or it may be social grooming, play, and even human conversation.

That emotions and emotion-related states emerge as part of a context within which various lines of action unfold seems indisputable here.

Strengths and Weaknesses of the Study

One of the advantages of the approach to this study is the large variety of expressers of emotion used. Often the expressions of only one or two actors or actresses are shown. Also, displays included as large a range of samples of emotionally expressive events as could be found. These events accounted for a selection of both "primary" and "secondary" emotion states. Furthermore, a broad selection of emotions was used. As Wallbott (1998) notes, many studies only use a few emotions, or just success and failure as emotional states. The structure of context and its accumulation, which Ginsburg and Harrington (1996) consider crucial to such an investigation, was also included in this study. Effort was made to ensure all events were displays of actual people involved in actual events in the real world.

It was unfortunate that participant numbers were not standardised across conditions or events. This was accounted for, however, as the number of participants who responded to each event in each condition (as shown in Table 1, Appendix 9) became a scaler to produce proportions which were comparable.

As Strongman (1996) points out, emotions cannot be distinguished from their expression in the same way as they are in the language. Consequently, there are drawbacks associated with asking participants to label emotion and emotion-related states detected within the displays. However, these were counteracted as much as possible. A definition was given for each emotion category in an attempt to improve across-participant

response consistency. The confidence ratings not only indicated how strongly a display was perceived as showing a particular emotional state. They also facilitated participants' indication that very little emotion was detected within a display. No response at all was offered as an option indicative that no emotion state whatsoever was detected. Additionally, participants were not asked to select just one category for each event. There was opportunity for indicating any number of the emotion categories listed that were picked up within a display.

Events used for conversion to the point-light displays, due to selection by those responding to the full view displays, represented particularly reliable examples of emotional expression. However, body movement was not the only source of information the events were selected on. The full view displays are rich with contextual and facial information also. It appears that at least some events were, in fact, selected on such criterion (Event 41, for example).

Michaels and Carrello (1981) point out that the duration of a transformation is tied to the time span of the event it specifies. Many events are incomplete, as the entire sequence of emotion expression has not been captured on film. It was not possible to control for this due to the ethical difficulties inherent in acquiring video footage of people spontaneously expressing themselves emotionally. The types of events used here were therefore constrained by the availability of appropriate material.

Future Directions

As previously noted, Strongman (1996), emphasises the point that emotions cannot be distinguished from their expression in the same way as they are in the language. Consequently, rather than impose verbally given meanings, efforts could be made to measure participants' categorisations against their own standards. This could be achieved in at least two ways. Firstly, by showing pairs of displays side by side and asking whether or not these are expressions of the same or different emotion and emotion-related states, with indications of confidence levels in these judgements, also. Secondly, freely written responses could be gathered describing emotion states perceived. The degree to which participants' recognition of the events concurs will be revealed in the data. This approach may gain currency in the exploration of cross-cultural differences also.

In this investigation, *spontaneous displays* were used. Does the biomechanical information available specify the difference between these and *intentional* displays of emotion? Baron (1981) has found indications that gestures, for example, are exaggerated in the latter.

In the discussion section it was noted that as expressive events unfold over time so, too, do changes in perception of emotion categories within the displays. Furthermore, there are differences between these emotion states detected within the full view and point-light displays. This seems consistent with Frijda's (1969) speculation that recognition of emotion depends both on

expressive and situational " cues". He suggests that the process of recognition of emotion can be considered as a two stage process:

- 1) assessment of the general positional activity pattern on the basis of expression.
- 2) subsequent specification of the pattern on the basis of situational and other contextual cues.

These differences beg some exploration, though. The Adobe Photoshop 4.0 computer program allows scope for reintroducing structure obliterated through the blackout process to varying degrees of opacity. Manipulating the displays in this way could shed further light on the effects incurred through increasing the amount and kind of information available. In this way we could control the progressive addition of sources of information to the point-light displays in a way which facilitates identification of that which is specific to detection of others' emotional states. Berry and Misovich (1994) insist that careful control such as this is most important to the study of social interaction.

The ecological approach to psychology also emphasises the importance of improved performance that occurs with the education of attention. The uniqueness of individual perspectives could be more closely studied by exploring the effects prior education of attention may have on subsequent perception of emotional expression. Becoming familiar with another individual's manner of displaying emotion may contribute significantly to an observer's ability to more keenly detect emotion expression within the point-light displays. Future research could draw on one individual's expression (for example, that of a family member, friend or flatmate) across the displays rather than using different individuals for each.

The correlations computed for this study included both within-participant and across-participant responses. A deeper understanding of the results could be obtained through studying the within-participant responses on their own. As Neisser (1976) points out, individual differences in perceivers' skill to extract information from the environment efficiently must also be considered. Thus, acknowledgement and exploration of the uniqueness of individual perspectives across the experimental conditions could be facilitated. Buck (1984) points out that a "poor perceiver" may be one who pays little or no attention to the emotional displays of others. As cultural differences illustrate well, it is possible for individuals to learn to attend to information which, nevertheless, remains "inaccessible" to others. For example, Ekman and Friesen (1969b) have noted how in Western culture people learn to be more aware of the face than the body.

A look at the gender of the expressers relative to that of the participant would be interesting also, as would taking the gender of the expresser into account in order to see how they differ in expressiveness.

It is also envisaged that these displays could be put to good use toward investigating reciprocal behaviours afforded observers when viewing the displays, as well as Mochotte's (1950) notion concerning integrative versus segregate aspects of emotion. Michotte considers the likelihood of a connection existing between the perception of these types of events and the perceiver's action following their detection. For example, the indication of friendship (an integrative event) is likely to afford approach on the part of the perceiver, whereas one of certain animosity (a segregate event) may lead, rather, to retreat. It seems relevant, to contemplate the idea that a greater

degree of interaction between the emotion displaying individual and the participant would yield valuable results. Once further development has improved our understanding of the crucial elements involved it seems likely that taking such information into interactive virtual reality environments could enhance our knowledge to an advanced degree.

Application to developing a method of time series analysis applicable to the point-light displays may shed important light on the extent to which there are particular patterns within bodily action that reliably indicate between emotion and emotion-related states.

Findings generated from studies such as these may not only contribute generally to our knowledge concerning, and education of attention to, social affordances within the environment, but have therapeutic application also. If there are coherently organised patterns of situated action that reliably indicate and discriminate among emotions, education of attention to these could aid the recovery of individuals suffering anxiety, post-traumatic stress, and dissociative difficulties as a result of disturbing social encounters. Prior to these conditions manifesting, individuals have experienced either singular or ongoing exposure to one or more traumatic event. It seems reasonable to suggest it likely that attention becomes highly attuned toward seeking out particular informational aspects of that event, so action can be taken to avoid or prevent a repeat encounter. If Ittleson (1973) & Zajonc (1980) are right in their suggestions that the initial level of response we have to the environment is emotional, this makes good sense here. As Arnold (1970) explains, under usual circumstances the development of such attitudes can be indispensable for daily life. However, in exceptional situations like these, maybe more useful,

particularly nonverbal, information is being overlooked within subsequent situations. Future research could focus on developing ways the ecological approach to psychology could be applied therapeutically.

CONCLUSION

It has become evident within this investigation that indications of emotion and emotion-related states are preserved from the full view to the point-light displays. The events in which the emotion states are most consistently detected from one condition to the other seem to be those in which the most body movement occurs. Consequently, the level of activation of body movements seems to partly differentiate various emotional states. There is some indication, also, that there may be some patterns within the bodily action that reliably indicate between emotions, which may help explain the so-called "triggering" influences individual's detection of such information is considered to have on their subsequent emotional feelings and behaviours.

Analysis of the temporal structure of the expressive and perceptive flow characteristic of events as they unfold and change over time suggests that those emotion states perceived through observation of an individual's body movements alone inform us most particularly of the individual's emotional experience on the personal level. Some information regarding the wider context seems evident through detection of learned movements and gestures reflecting "display rules" which have been incorporated within an individual's repertoire of expressiveness.

When we consider emotion in terms of the person-environment relationship, however, it becomes evident that the individual's emotional actions themselves are only part of the contents of the events which follow. Emotions seem to play an adaptive role in human functioning, and through

attending to these we are informed about our own *and* others' interactions within the world.

There is evidence to suggest that there are body movements or blends of these that are indicative of emotional states reflecting individuals' transitional experiences as they interact with others on the negotiative level. Such emotion states may, perhaps, be explained in terms of the information they provide us personally as to the nature and experience of a situation, and whether or not this facilitates our moving towards our goals. On the basis of such information we can then choose whether or not to adapt to or change some aspect of the situation. "Secondary" emotions seem to exist within the socially and culturally negotiated levels of interaction in the environment. The impact such changes afford the individual may be reflected in the experiences and accompanying expressions on the primary level.

Consequently, it seems reasonable to propose that the expressive behaviours evident within the transformations of body movement over time unfold sequentially, relative to the effectiveness of the individual's negotiative interactions with others facilitating progress towards the personal goal.

Our sense of 'intuiting' other people's emotional states may, perhaps, be better explained in terms of the amount of attention we devote to differing aspects of information available for detection within the complex array.

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APPENDIX

Appendix 1

BECOME A VOLUNTEER AND GO IN THE DRAW TO WIN A CD OF YOUR CHOICE (VALUE \$40.00)

Volunteers aged between 17 and 24 are invited to participate in a research project investigating the perception of emotional states from observation of body movement alone.

As a participant you will go in the draw to win a CD of your choice to the value of \$40.00. The draw will take place as soon as the required number of participants has been tested. At the time of testing you will fill in and sign a slip of paper that will go into a container out of which Robyn Daly, Administrative Assistant, Dept. of Psychology will draw the winner.

IF YOU ARE INTERESTED IN PARTICIPATING IN THIS PROJECT (which will take place in the level 2 computer lab, Psychology building) PLEASE SELECT A DATE AND TIME FROM THE LIST BELOW AND WRITE THIS ALONG WITH YOUR NAME, E-MAIL ADDRESS AND TELEPHONE NUMBER IN ONE OF THE SPACES BELOW. ALTERNATIVELY, PLEASE RESPOND BY EMAIL TO ME AT ADDRESS pgm43@student.canterbury.ac.nz

- 1) Thursday September 16th 1999 from 10.00 – 10.45 am
- 2) Thursday September 16th 1999 from 11.00 – 11.45 am
- 3) Friday September 17th 1999 from 1.00 – 1.45 pm
- 4) Friday September 17th 1999 from 2.00 – 2.45 pm

Many thanks, Pearl Makeig.

NAME
PHONE

DATE AND TIME

E-MAIL ADDRESS

Appendix 2

University of Canterbury
Department of Psychology

INFORMATION

You are invited to participate as a subject in a research project investigating the perception of emotional states from observation of body movement alone.

Participation in the project will involve observing video clips of people in various emotional states, then indicating which emotions you perceive and your level of confidence in each judgement. Performance of the actual task will take approximately 35 minutes.

Most events presented in the study have been taken from freely available television programmes such as documentaries and news. It is possible, however, that some material may be distressing to some viewers.

The results of the project may be published, but you may be assured of the complete confidentiality of data gathered in this investigation, as the information you offer to this study will be maintained anonymously. You will not be identified as a participant.

The project is being carried out as a requirement for MSc. by Pearl Makeig, under the supervision of Dr. Dean Owen, who can be contacted by phone nos. 3852337, and 3667001 extn. 6166, respectively. They will be pleased to discuss any concern you may have about participation in this project.

The University of Canterbury Human Ethics Committee has reviewed this project.

You may at any time withdraw your participation, including withdrawal of any information you have provided.

By completing the task, however, it will be understood that you have consented to participate in the project, and that you consent to publication of the results of the project with the understanding that anonymity will be preserved.

Appendix 3

FULL VIEW (PILOT) STUDY EMOTION LIST

ANXIETY – fearful concern or interest

AGITATION – mental anxiety or concern

ANGER – extreme or passionate displeasure

RAGE – a violent or uncontrolled anger

BRAVADO – a bold manner or a show of boldness to impress

FRUSTRATION –emotion associated with being prevented from achieving a purpose

FEAR – to be afraid or apprehensive

ANGUISH – severe misery or mental suffering

SADNESS – affected with or expressive of grief or unhappiness

DESPAIR – the complete loss or absence of hope

DEJECTION – lowness of spirits

PLEADING – making an earnest appeal to

EMBARRASSMENT – feeling of awkwardness or self-consciousness

SHAME – a state of disgrace, discredit, or intense regret

HORROR – a painful and intense fear, dread, or dismay

SHOCK – a sudden and disturbing effect on the emotions

SURPRISE – the emotion caused by an unexpected event or circumstances

EXCITEMENT – the action or state of being roused

JUBILATION – an act of rejoicing

EXULTATION – feeling of triumph

AFFECTION - fond or kindly feeling

HAPPINESS – a state of well-being and contentment

Appendix 4

NAME:-----to go in the draw
for the Perception of Emotion Project participation.

E-MAIL ADDRESS:-----

HOME NUMBER:-----SIGNED: -----

Appendix 5

The conversion process of events from full view to point-light displays

The video recording of each event was imported as a series of frames into the Video Card Par Drive.

Using the Adobe Photoshop 4.0 computer program, the first of a series of frames was opened and a new transparent layer placed over the top. An additional new layer was then created, the background highlighted, the foreground colour set as white, and the pencil tool selected (set as Brush Size Precise under the Preferences, Displays, and Cursors option). Appropriate and equal sized white spots were then painted on each shoulder, elbow, wrist, hip, knee, and heel joint of the expresser, as well as one on the head, and one central to each set of fingers. (Hands were included in these displays, as their movements seem integral to the expression of emotion and emotion-related states.) The entire background of the frame was then blacked out using the "paint bucket" tool, with foreground colour set as black, so only the white spots remained in view.

The second frame in the series was then opened, and a transparent layer was placed over this as before. After clicking the cursor on the background box with the left mouse-button, a copy of the first completed frame was pasted over this second frame. Opacity was reduced to approximately 25% so the position of each spot painted on the first frame could be viewed. Layer one was then highlighted and the frame shifted to the left of the Par Player window position.

Clicking on the Par Player icon, then selecting successively the first then second frame for viewing on the video monitor directly above and behind the computer screen, made it possible to switch back and forth from one frame to the other. This facilitated close observation of the degree and direction of movement of each joint across these two frames. A white spot was thus painted in the most correct position possible on the active layer of the frame currently being worked on (see Figure 52). As before, the entire background of this next frame was blacked out so only the white spots remained visible. A copy of the first completed frame was then saved.

This procedure was followed for every successive frame used for each event. (For 13 of the events the entire full view was not converted to a point-light display as it seemed unnecessary to include numerous repetitions of the same movements within a display.)

Once a set of frames was converted in the above way, it was then imported back into the Par Drive as a point-light display.

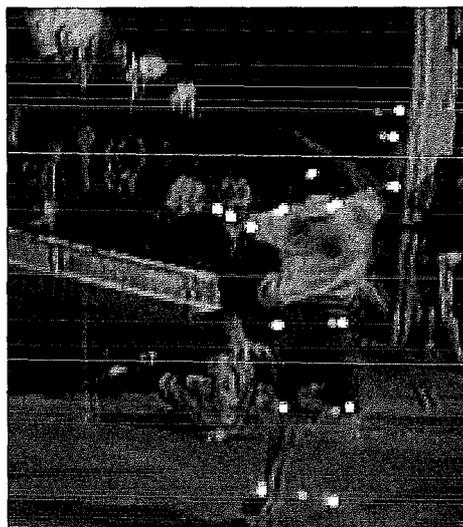


Figure 52.
Two successive frames, one pasted over the other, showing the conversion process from full view to point-light display.

Appendix 6

Event 1. *3.32 sec for both conditions.*
Male running from dynamite explosion.

Event 2. *9.12 sec for both conditions*
Young woman at a festival.

Event 3. *8.24 sec for both conditions*
Law enforcement officer approaching vehicle is unexpectedly threatened/attacked by the driver.

Event 4. *3.44 sec for both conditions*
Boy on playground with friends.

Event 5. *17.56 sec for both conditions*
Motorist explaining to parking warden why he should not have been given a parking ticket.

Event 6. *5.4 sec for both conditions*
Young woman receiving fishing award.

Event 7. *6.72 sec for both conditions*
Man kicking up a fuss due to not being able to retrieve his clamped and confiscated motor vehicle.

Event 8. *4.04 sec for both conditions*
Another young woman at a festival.

Event 9. *5.6 sec for both conditions*
Amateur "Manpower " participant's distress after accidentally removing more than his shorts during strip show.

Event 10. *2.12 sec for both conditions*
Winner of karate event.

Event 11. *3.32 sec for FV; 2.4 sec for PL conditions*
Disgruntled tennis player.

Event 12. *2.0 sec for both conditions*

Man on mountain discussing with his friend the likelihood that he will never see his family again.

Event 13. *8.4 sec for both conditions*

Christmas (family gathering) kiss.

Event 14. *5.84 sec for FV; 5.48 sec for PL conditions*

Male leaping out of the way of 2 cars skidding towards him – he just escapes being run down.

Event 15. *1.72 sec for both conditions*

Girl jumping up and down on sideline of sports game.

Event 16. *7.16 sec for both conditions*

Young man being held at gunpoint by police officer.

Event 17. *2.44 sec for both conditions*

A young man pushing another during service station robbery / attack.

Event 18. *6.56 sec for both conditions*

Amateur "Manpower" participant's further distress after accidentally removing more than his shorts during strip show.

Event 19. *4.96 sec for both conditions*

Girl, seated on ground, laughing with friends.

Event 20. *1.48 sec for both conditions*

Young man kicking during riot.

Event 21. *4.08 sec for both conditions*

Young woman walking with boyfriend.

Event 22. *14.64 sec for FV; 9.68 sec for PL conditions*

Woman who has just won Olympic high-jump event.

Event 23. *2.08 sec for both conditions*

Animated sport player.

Event 24. 40.48 sec for FV; 17.56 sec for PL conditions
Woman instructing driver of car.

Event 25. 9.88 sec for both conditions
Police officer berating arrested male, due to his colleague having just been bitten by the offender's dog.

Event 26. 7.68 sec for FV; 2.6 sec for PL conditions
Man on edge of cliff reacting to sudden sea spray.

Event 27. 4.04 sec for FV; 2.64 sec for PL conditions
Man fleeing edge of erupting volcano.

Event 28. 1.72 sec for both conditions
Sport spectator.

Event 29. 35.76 sec for FV; 6.4 sec for PL conditions
Young woman singing and laughing with friends.

Event 30. 6.08 sec for both conditions
Young man kicking and attacking service station proprietor during hold-up.

Event 31. 4.12 sec for both conditions
Reporter avoiding gunfire.

Event 32. 0.88 sec for both conditions
Young man throwing stone at person operating video camera.

Event 33. 2.24sec for both conditions
Male surprised when camel suddenly butts his face.

Event 34. 3.36sec for both conditions
Victorious moment in sports game.

Event 35. 1.84sec for both conditions
Startled golf player ("bloopers").

Event 36. *7.44sec for both conditions*
Woman joining in singing and playfulness with others.

Event 37. *20.12 sec for both conditions*
Reporter accidentally drops microphone into water ("bloopers").

Event 38. *2.36 sec for both conditions*
Winning tennis player about to hug her doubles partner.

Event 39. *7.72 sec for both conditions*
Angry motorist berating parking warden for issuing of parking ticket.

Event 40. *2.8 sec for both conditions*
Sport spectator.

Event 41. *4.72 sec for both conditions*
Seated woman laughing with friends.

Event 42. *2.4 sec for both conditions*
Young man involved in rioting and overturning car.

Event 43. *7.48 sec for FV; 7.44 sec for PL conditions*
Another disgruntled tennis player.

Event 44. *3.2 sec for both conditions*
Sport spectator.

Event 45. *7.2 sec for FV; 6.08 sec for PL conditions*
Actress's dress accidentally falls off her shoulders to the floor ("bloopers").

Event 46. *6.12 sec for FV; 4.96 sec for PL conditions*
Woman arguing with neighbour.

Event 47. *6.04 sec for FV; 4.84 sec for PL conditions*
Boy running from kite diving down towards him.

Event 48. *11.16 sec for both conditions*
Woman laughing.

Event 49. *2.64 sec for both conditions*
Young man attending Princess Diana's funeral.

Event 50. *16.4 sec for FV; 14.52 sec for PL conditions*
Man warding off then fleeing a whipping.

Event 51. *.2.28 sec for both conditions*
Sportsman celebrating goal score with spectators.

Event 52. *6.8 sec for both conditions*
Woman greeting her mother at the door, hugging, then inviting her into her home.

Event 53. *1.68 sec for both conditions*
Woman startled by person dressed in monkey suit.

Event 54. *1.2 sec for both conditions*
Part of road rage incident, where a male lashes out at another with a baseball bat.

Event 55. *3.24 sec for both conditions*
Pedestrian runs from car skidding towards him.

Event 56. *4.08 sec for FV; 4.88 sec for PL conditions*
Amateur "Manpower" participant's further distress after accidentally removing more than his shorts during strip show.

Event 57. *4.88 sec for both conditions*
Police officer avoiding being arrested.

Event 58. *2.56 sec for both conditions*
Victorious sport player.

Event 59. *4.08 sec for both conditions*
Young woman at a festival.

Appendix 7

KINEMATIC STUDY EMOTION LIST ONE

EXCITEMENT – the action or state of being roused

JUBILATION – an act of rejoicing

EXULTATION – feeling of triumph

AFFECTION - fond or kindly feeling

HAPPINESS – a state of well-being and contentment

FEAR – to be afraid or apprehensive

DESPAIR – the complete loss or absence of hope

DEJECTION – lowness of spirits

SURPRISE – the emotion caused by an unexpected event or circumstances

SHOCK – a sudden and disturbing effect on the emotions

AGITATION – mental anxiety or concern

ANGER – extreme or passionate displeasure

RAGE – a violent or uncontrolled anger

FRUSTRATION –emotion associated with being prevented from achieving a purpose

EMBARRASSMENT – feeling of awkwardness or self-consciousness

KINEMATIC STUDY EMOTION LIST TWO

AGITATION – mental anxiety or concern

ANGER – extreme or passionate displeasure

RAGE – a violent or uncontrolled anger

FRUSTRATION –emotion associated with being prevented from achieving a purpose

FEAR – to be afraid or apprehensive

DESPAIR – the complete loss or absence of hope

DEJECTION – lowness of spirits

EMBARRASSMENT – feeling of awkwardness or self-consciousness

SHOCK – a sudden and disturbing effect on the emotions

SURPRISE – the emotion caused by an unexpected event or circumstances

EXCITEMENT – the action or state of being roused

JUBILATION – an act of rejoicing

EXULTATION – feeling of triumph

AFFECTION - fond or kindly feeling

HAPPINESS – a state of well-being and contentment

Appendix 8

NOTICE REQUESTING VOLUNTEERS TO PARTICIPATE IN THE PROJECT INVESTIGATING THE PERCEPTION OF EMOTION.

Volunteers are invited to participate as subjects in the research project exploring the perception of emotion.

The aim of this project is to investigate the hypothesis that observation of body movement alone may be sufficient in itself for recognition of emotional states.

Your participation in this project will involve specifying whether you perceive indications of emotion(s) or emotion-related states while observing video clips of point-light displays of people expressing various emotional states, along with your level of confidence in each judgment;

Performance of the task will take approximately 50 minutes.

The information gathered for this project will be maintained anonymously, and volunteers will not be identified as participants.

Participation may be withdrawn at any time, including withdrawal of any information provided.

IF YOU ARE INTERESTED IN PARTICIPATING IN THIS PROJECT (which will take place in the level 2 postgrad. computer lab, Psychology building) PLEASE SELECT A DATE AND TIME FROM THE LIST BELOW AND WRITE THIS ALONG WITH YOUR NAME, E-MAIL ADDRESS AND TELEPHONE NUMBER IN ONE OF THE SPACES BELOW. ALTERNATIVELY, PLEASE RESPOND BY EMAIL TO ME AT ADDRESS pgm43@student.canterbury.ac.nz

With many thanks, Pearl Makeig.

(Dates and times were listed on the pages that followed.)

Appendix 9

Table 1.
Numbers of participants who viewed each event in both conditions.

Number of Participants			Number of Participants		
Event	Full View	Point-light	Event	Full View	Point-light
1	19	40	31	19	48
2	19	46	32	19	44
3	19	46	33	19	44
4	13	46	34	13	44
5	13	50	35	19	44
6	19	39	36	13	44
7	19	39	37	19	44
8	19	39	38	19	44
9	13	39	39	19	37
10	19	41	40	5	46
11	19	41	41	19	47
12	19	48	42	13	40
13	19	48	43	13	40
14	19	48	44	13	40
15	13	48	45	19	40
16	13	43	46	19	40
17	13	43	47	13	39
18	13	48	48	13	40
19	13	48	49	25	40
20	13	49	50	13	38
21	19	49	51	19	33
22	13	49	52	19	33
23	13	46	53	13	33
24	25	46	54	32	33
25	19	46	55	13	33
26	19	46	56	19	37
27	13	55	57	19	37
28	19	55	58	13	37
29	19	52	59	19	37
30	19	48			

Appendix 10

University of Canterbury

Department of Psychology

INFORMATION

You are invited to participate as a subject in a research project investigating the perception of emotional states from observation of body movement alone.

Participation in the project will involve observing point-light displays of people in various emotional states, then indicating which emotions you perceive and your level of confidence in each judgement. Performance of this task will take approximately 40 minutes.

The results of the project may be published, but you may be assured of the complete confidentiality of data gathered in this investigation, as the information you offer to this study will be maintained anonymously. You will not be identified as a participant.

The project is being carried out as a requirement for MSc. by Pearl Makeig, under the supervision of Dr. Dean Owen, who can be contacted by phone nos. 3852337, and 3667001 extn. 6166, respectively. They will be pleased to discuss any concern you may have about participation in this project.

The University of Canterbury Human Ethics Committee has reviewed this project.

You may at any time withdraw your participation, including withdrawal of any information you have provided.

By completing the task, however, it will be understood that you have consented to participate in the project, and that you consent to publication of the results of the project with the understanding that anonymity will be preserved.

Appendix 11

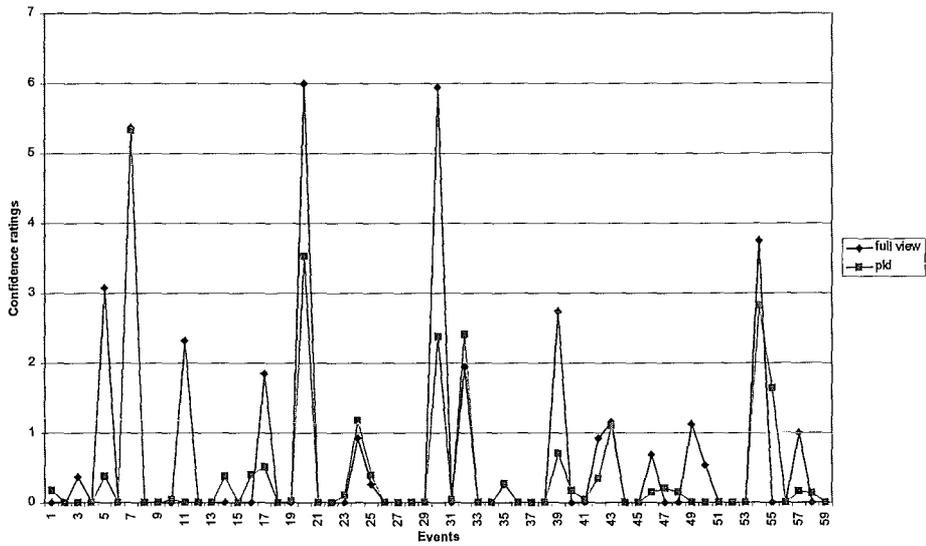


Figure 10. Line graph illustrating the correlation between the average confidence ratings of perception of **rage** across all events for the full view and the point-light conditions.

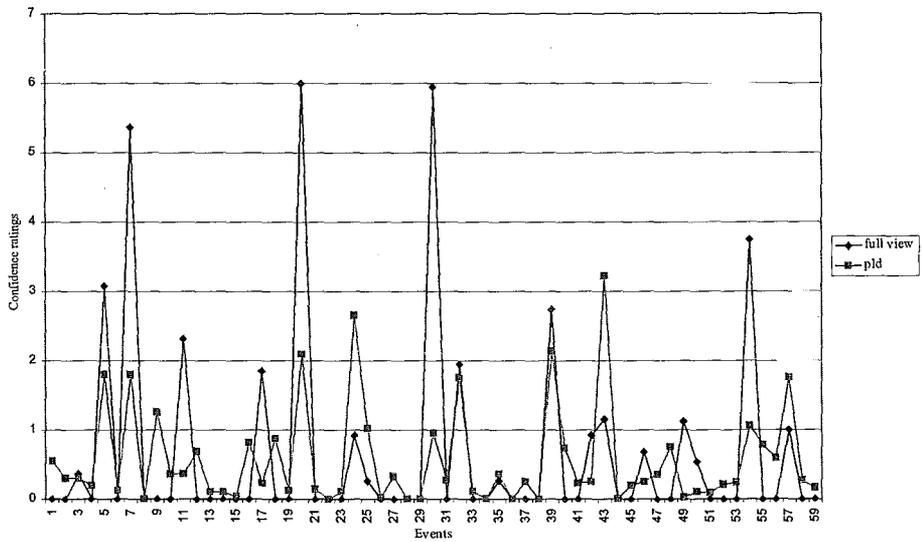


Figure 11. Line graph illustrating the correlation between the average confidence ratings of perception of **frustration** across all events for the full view and the point-light conditions.

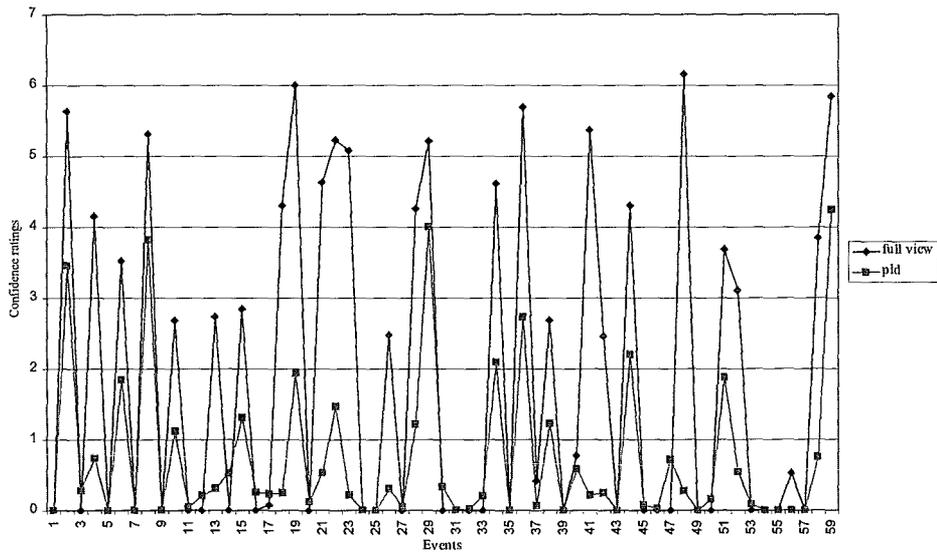


Figure 12. Line graph illustrating the correlation between the average confidence ratings of perception of **happiness** across all events for the full view and the point-light conditions.

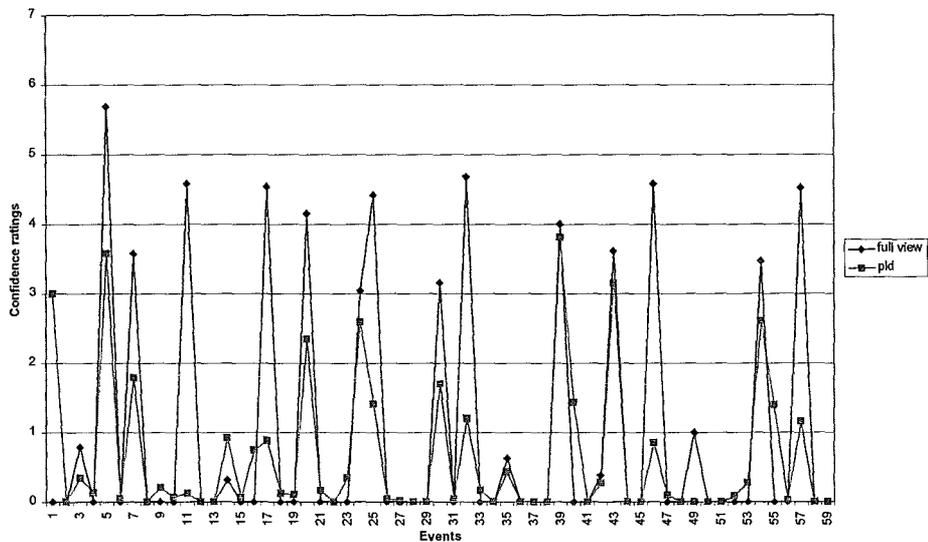


Figure 13. Line graph illustrating the correlation between the average confidence ratings of perception of **anger** across all events for the full view and the point-light conditions.

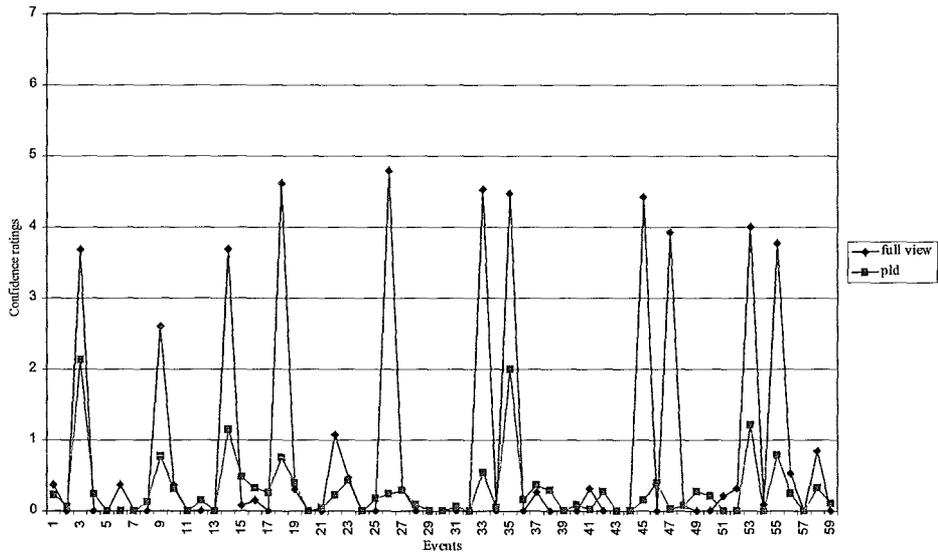


Figure 14. Line graph illustrating the correlation between the average confidence ratings of perception of **surprise** across all events for the full view and the point-light conditions.

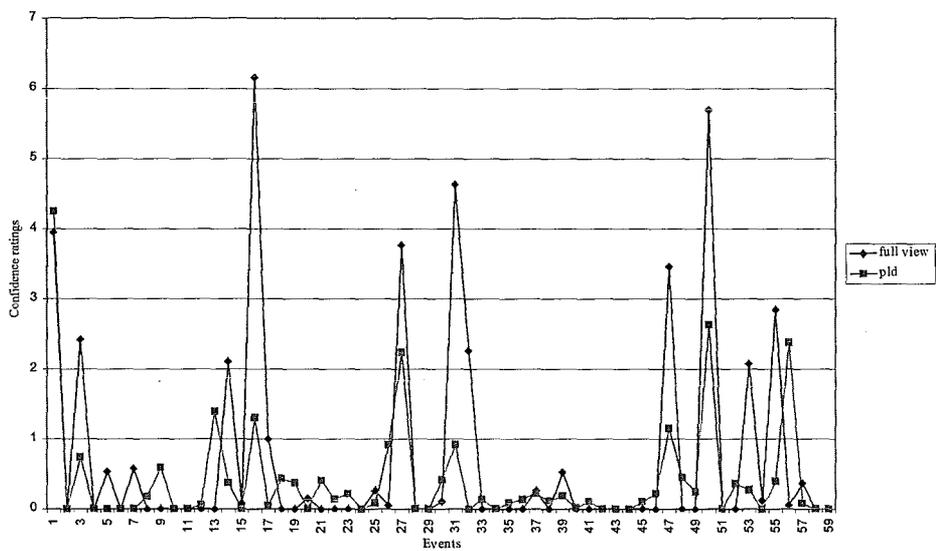


Figure 15. Line graph illustrating the correlation between the average confidence ratings of perception of **fear** across all events for the full view and the point-light conditions.

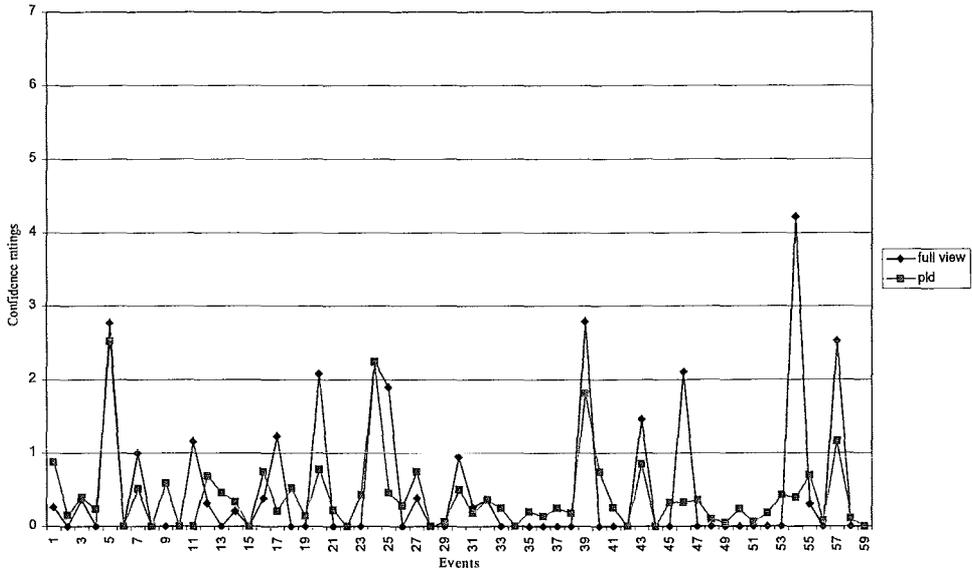


Figure 16. Line graph illustrating the correlation between the average confidence ratings of perception of **agitation** across all events for the full view and the point-light conditions.

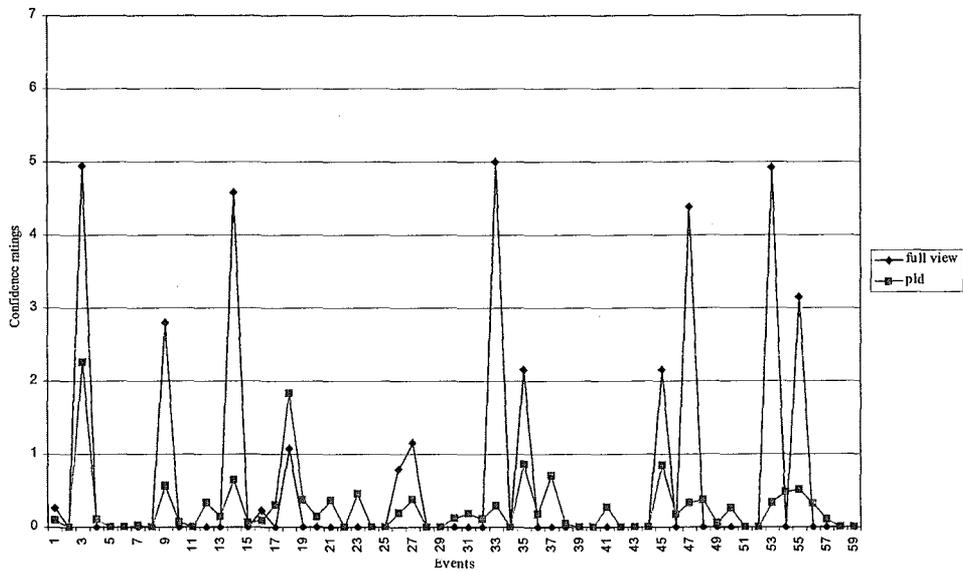


Figure 17. Line graph illustrating the correlation between the average confidence ratings of perception of **shock** across all events for the full view and the point-light conditions.

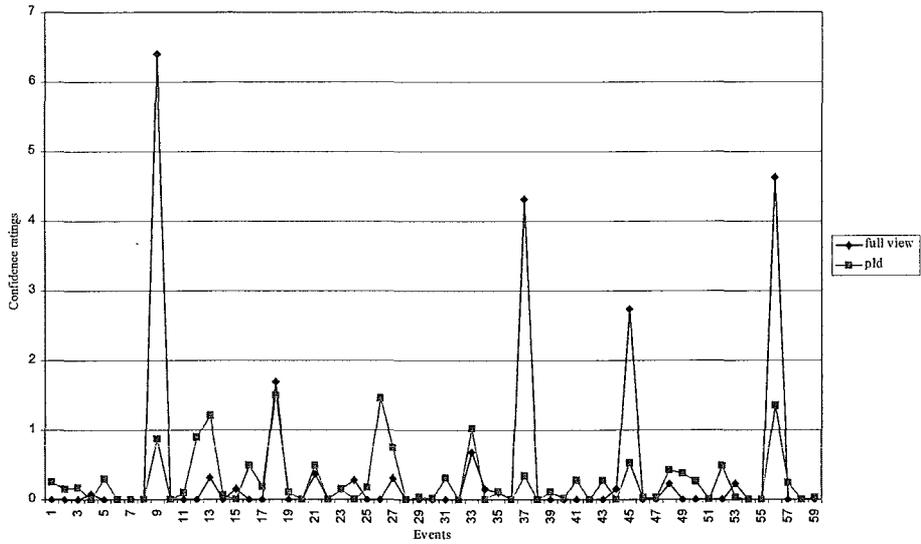


Figure 18. Line graph illustrating the correlation between the average confidence ratings of perception of **embarrassment** across all events for the full view and the point-light conditions.

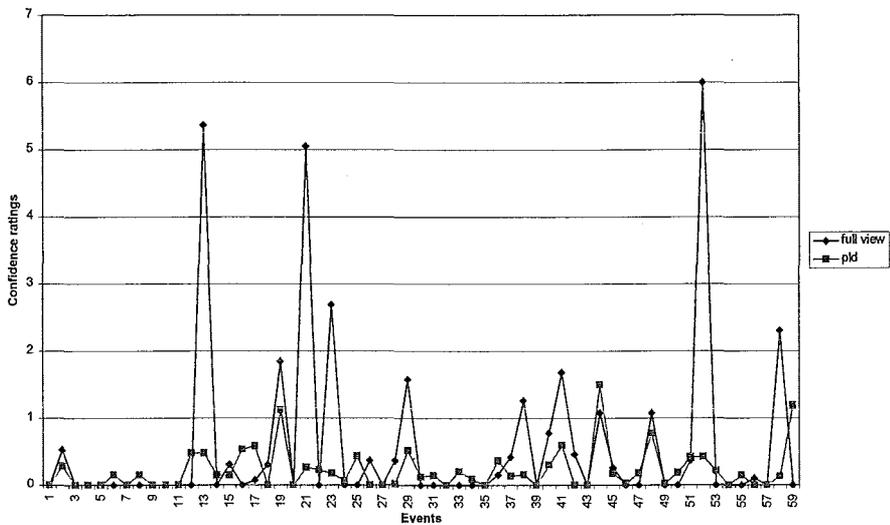


Figure 19. Line graph illustrating the correlation between the average confidence ratings of perception of **affection** across all events for the full view and the point-light conditions.

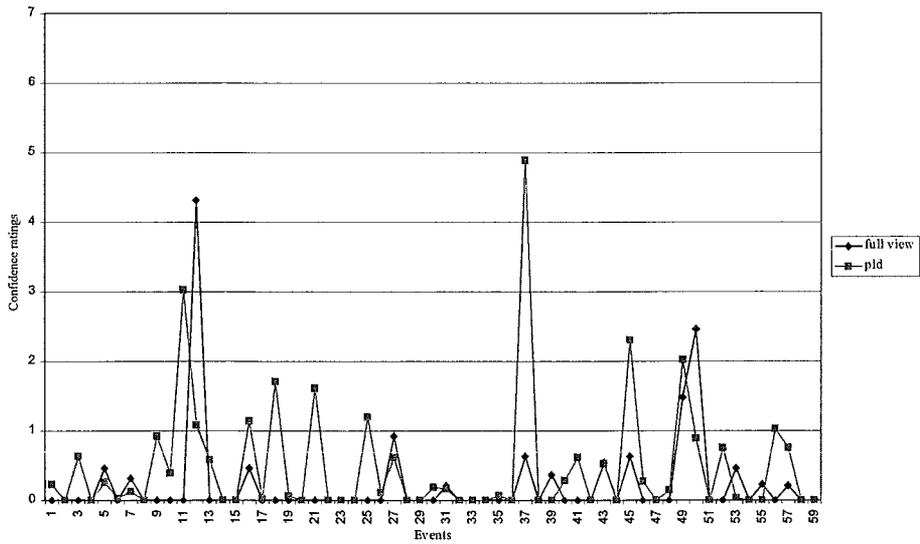


Figure 20. Line graph illustrating the correlation between the average confidence ratings of perception of **despair** across all events for the full View and the point-light conditions.

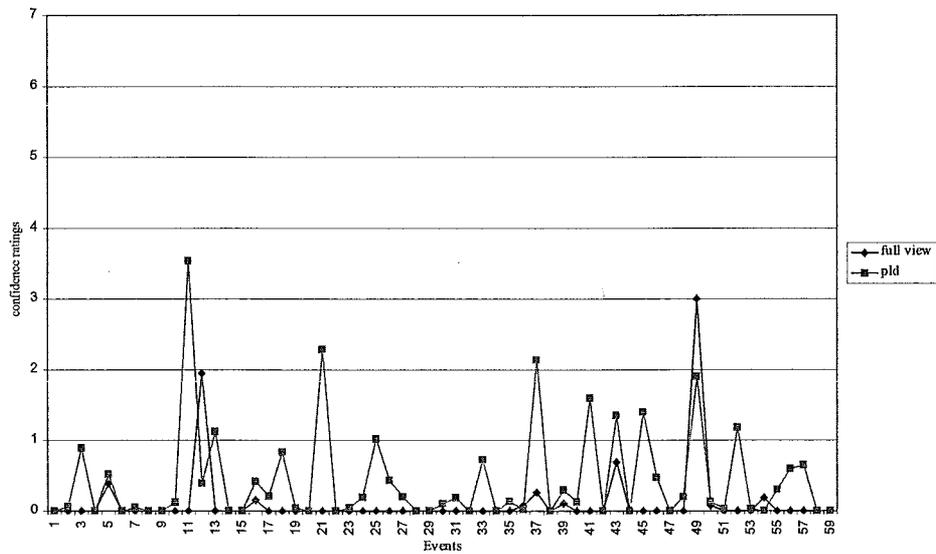


Figure 21. Line graph illustrating the correlation between the average confidence ratings of perception of **dejection** across all events for the full view and the point-light conditions.