Studying Aggression in School Children:
The Use of a Wireless Microphone and Micro-Video Camera

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This paper describes a wireless microphone and micro-video camera used successfully by the present authors to study direct, indirect, and relational forms of aggression in schools. Two major advantages of this equipment are identified; first, it avoids some of the potential biases and difficulties associated with the other methods and, second, it allows researchers to record and analyze a large number of significant variables that may otherwise be difficult to assess. The importance of this kind of data is discussed in relation to the development of effective interventions aimed at reducing aggression in schools. Aggr. Behav. 28:356–365, 2002. © 2002 Wiley-Liss, Inc.

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INTRODUCTION

Aggression among school children is associated with the development of concurrent and future adjustment difficulties in both aggressors and victims. Persistently victimized children have been shown to suffer from higher levels of depression, anxiety, and loneliness compared with nonvictimized children [Crick and Bigbee, 1998; Crick and Grotpeter, 1995] and to be more likely to suffer adjustment problems in later life [see Olweus, 1993]. Aggressive behavior can also lead to peer rejection [Coie and Kupersmidt, 1983; Crick and Grotpeter, 1995; Dodge, 1983], which may in turn contribute to further antisocial behavior together with long-term delinquency and social maladjustment [Patterson et al., 1989]. However, if attempts to reduce aggression in schools are to be successful, they must be underpinned by a thorough understanding of the ways in which these behaviors develop and are maintained. This in turn requires an appropriate means of studying aggression. The recent identification of indirect and relational forms of aggression present a particular challenge to researchers because they are frequently subtle and difficult for observers to identify compared with their more commonly studied direct/overt counterparts (such as physical aggression and verbal insults) [Crick and Grotpeter, 1995; Lagerspetz et al., 1988]. Nonetheless, relational aggression has

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also been shown to be associated with difficulties in social development and adjustment [Crick and Bigbee, 1998; Crick and Grotpeter, 1995; Crick et al., 1999; Werner and Crick, 1999].

The most commonly employed means of studying both direct/overt and indirect/relational forms of aggression has been through the use of teacher reports and peer reports. An advantage of report measures is that they are a time- and cost-efficient way of assessing aggression in school children. However, there is some evidence to suggest that they may be subject to bias [e.g., see McNeilly-Choque et al., 1996; Tapper, 1998]. In addition, report measures have mainly been used to assess levels of aggression in individual children. The extent to which these measures could be used to provide valid information about other aspects of aggressive behavior, for example, the responses of the victims, is unclear. However, it is these aspects of aggression that may be crucial to furthering our understanding of aggression and devising effective intervention strategies. For example, both behaviorist theory and social learning theory predict that levels of aggression will be related to the consequences the aggressor receives for his or her aggression [e.g., see Bandura, 1973, 1977; Mattaini et al., 1996]. Drawing on behaviorist theory, Patterson and colleagues employed extensive observations to identify the process of aggressive "coercion" within the home environment [e.g., see Patterson and Cobb, 1971]. This research subsequently led to the design of interventions in the home that proved to be effective in reducing aggression in this context [see Kazdin, 1987, for a review]. It is unlikely that this could have been achieved without the observational data.

However, with the exception of recent work conducted by Pepler and colleagues [Atlas and Pepler, 1998; Craig et al., 2000; Pepler et al., 1998], studies examining the consequences of aggression in primary schools have been restricted to children's reports [Perry et al., 1986, 1989, 1990; Salmivalli et al., 1996]. As Archer [1995] noted, the study of human aggression has tended to omit the descriptive phase common to other disciplines, which has in turn often resulted in a lack of ecological validity in experimental studies of aggression. Clearly, if we are to gain a full understanding of aggression within schools, it is important to gain descriptive data on the way in which aggression is responded to by other children.

However, some researchers have argued that observational measures are not suitable for studying indirect and relational aggression. Crick and Grotpeter [1995] claimed that "relationally aggressive behaviors, because of their relatively individual nature and focus on peer relationships, might be difficult for those outside the peer group (e.g., teachers, researchers) to reliably observe and evaluate in naturalistic settings" (p 712). Similarly, Björkqvist et al. [1992b] state that "indirect aggression is extremely difficult to recognise" (p 53) and that "much will go unnoticed by the observer" (p 54). To the authors' knowledge, there have been no proximal observational studies employing the direct-indirect distinction and only one employing the overt-relational distinction [McNeilly-Choque et al., 1996]. As outlined previously, in this latter study, there was high inter-method agreement between proximal observations, peer reports, and teacher reports for overt aggression but lower and more inconsistent agreement for relational aggression, and the authors noted that "not all verbal exchanges could be clearly heard" (p 64). These findings seem to suggest that the study of indirect and relational aggression presents a particular problem for proximal observations, especially in more open environments such as the playground.

Although Crick and Grotpeter [1995] and Björkqvist et al. [1992b] do not expand on the reasons for their objections to the use of observational methods for measuring relational and indirect aggression, it seems likely that they were referring to proximal observations. As

noted above, these may result in limited observations on the playground because the observer will only be aware of those instances that are within earshot. A second reason that observational methods might be considered inappropriate is because of the specific forms that relational and indirect aggression can take. The identification of such forms of aggression may rely on knowledge of the history of relations between the aggressor and the victim, and this knowledge might be available only to those children involved. For example, if child A and child B have a mutual understanding that they always sit next to one another at lunchtime, child B's decision to sit at a different table would be classed as relational aggression if child B is deliberately ignoring child A. Such an instance could be missed by an outsider even if the speech of the two were available and therefore could present a problem for observational measures. However, it is arguable that peer reports will not overcome these problems either. For example, Björkqvist et al. [1992a] and Lagerspetz and Björkqvist [1994] use the item "gossip" as a measure of indirect aggression. However, gossip need not always be vindictive and in some cases may stem out of concern for a friend. If the perpetrator has done a good job of disguising his or her aggressive intentions, the majority of peers, if not all, will not be aware of the perpetrator's aggression. In cases such as these, it may only be the perpetrator who can accurately code his or her behavior as aggressive. Likewise, many peers will probably not be aware of one child ignoring another child. As a result, peer reports may be subject to some of the same difficulties of accurate coding as observational studies, especially when those reporting do not have much contact with the child in question.

REMOTE AUDIO AND VIDEO RECORDING

The development of new technology has provided novel ways to collect observational data, some of which have the potential to overcome the major difficulties associated with proximal observations outlined above. The remainder of this paper describes how we used a remote audio transmitter combined with a micro camera and video equipment in a study we recently completed. This proved to be particularly effective for observing aggression because it enabled us to capture the relatively subtle forms of indirect and relational aggression that would probably have been missed by the more traditional proximal observations. The equipment allowed verbal exchanges to be recorded even when the observer was out of earshot. It therefore enabled incidents of verbal aggression to be accurately identified in the relatively large open spaces of the school playground. The remote audio transmitter is a relatively new piece of equipment that, to current knowledge, has only been used in Canada [Atlas and Pepler, 1998; Craig et al., 2000; Pepler and Craig, 1995; Pepler et al., 1998]. In addition, there is no record of a remote audio transmitter being used in conjunction with a micro camera. The present research therefore allowed us to evaluate this equipment for the purposes of studying naturally occurring aggression and in particular for studying indirect and relational aggression.

Description of the Equipment

The equipment consisted of a TOA WM370 microphone, audio transmitter, and receiver; a camera manufactured by Chugai Boyeki (UK) Ltd containing a wide-angled lens; and a portable VHF video recorder. The audio receiver, camera, and video recorder were connected so that both the sound and picture were recorded simultaneously onto a standard VHF video cassette.

The transmitter was placed inside an $11 \times 7.5 \times 2.5$ cm sealed black box with a hole for the microphone lead. This was then placed in a small waist bag. The target child (see procedure) wore the waist bag around his or her waist, and the microphone was clipped to his or her clothing. Five other waist bags with dummy microphones and black boxes were used for the purposes of habituation (see procedure).

The video recorder and receiver were placed in a 25-liter rucksack. The camera fitted into a badge ($8 \times 6 \times 2.5$ cm) stating the name and institution of the researcher. A small rectangular hole measuring 4×5 mm was cut into the badge for the camera lens. This was cut into a black horizontal line down the center of the badge and, as a result, was very difficult to see unless one studied the badge carefully. The badge was attached to the left strap of the rucksack, and the wires were hidden inside the strap. The rucksack was either worn by the researcher or placed in a convenient position with the badge (i.e., camera) facing toward the target.

Limitations of the Equipment

Although the video camera produced a very clear and detailed picture when the subject was in close range, at distances of more than approximately 20 meters the picture was still clear but became less detailed and one could not, for example, recognize facial expressions. At distances of more than approximately 30 meters it was not always possible to identify those recorded. In some cases this problem was overcome by the use of field notes (see procedure) or it was possible to identify the child by another means (e.g., the child's name may have been used by another child or the child may have been within a range enabling identification at an earlier or later point). In a small number of cases, identification was not possible.

The advertised range of the audio receiver was 30 to 60 meters. In practice, the range varied with the weather and the number of obstacles between the transmitter and the receiver. There may also have been other unknown sources of interference. As a result, the sound on the recording cut out at certain points, and this meant that certain aspects of a small number of aggressive incidents were uncodable.

The speech of the target child was reliably recorded when he or she was within range. The microphone did not, however, always pick up the speech of others. As well as the distance between the target child and the other speaker, the extent to which the speech of the other speaker could be heard depended on the size of the room (if any), the level of background noise, the volume and tone of the voice, and the weather. Again, this meant that certain aspects of a small number of aggressive exchanges were uncodable.

Habituation

Seventy-seven children in years 3 and 6 (ages 7 to 8 and 10 to 11 years, respectively) from two British primary schools participated in the study. The children were told that they would be recorded some of the time that they were wearing a microphone but that most of the time they would not be recorded. They were also asked to act normally while wearing the microphones and were told that it would not matter what they said since only the researcher, and perhaps other researchers from the university, would listen to the recordings. It was emphasized that neither their teachers nor their parents would be told about anything they said while being recorded and that they would not get into trouble of any kind.

Each child wore one of the waist bags and microphones for 3 to 4 hours a day for a minimum of 4 days before they were recorded.

The first 4 or 5 days at each school served as both a pilot period for the researcher and a habituation period for the children to both the microphones and the researcher's presence. After this time, up to five children were habituated to the dummy microphones while another child wore the real microphone and served as the target. Due to absences, it was necessary to always have at least two children fully habituated at one time; thus, if one of these children was away on the day he or she was to serve as the target, the other child could serve as the target in his or her place. As a result, participants did not always wear microphones on consecutive days, and there were not always five other children wearing microphones.

The length of habituation required, based on the absence of verbal and behavioral references to the microphone, was determined in the pilot studies. This period varied considerably from child to child and also seemed to be slightly longer for older children. However, in general, the children appeared to habituate to the microphones very quickly, and in many cases there were no references to the microphones by lunchtime of the first day. The majority of children were making few or no references to the microphones by the third day. These findings are consistent with previous studies that suggest that reactivity to wireless microphones is small [Moos, 1968, cited in Goldfried, 1982; Pepler and Craig 1995] and decreases rapidly over a short period of time [Purcell and Brady, 1966, cited in Goldfried, 1982].

In terms of the length of habituation period, it was also necessary to take into account the child's willingness to wear the microphone. The first child that participated in the study was habituated for 5 consecutive days. However, on the sixth day she said she did not want to wear the microphone any more and, as a result, could not participate in the observational study. A second child was also habituated for 5 consecutive days and although she did agree to wear the microphone a sixth time, she was more reluctant to do so. Both of these children had been keen to wear a microphone initially and had specifically asked the researcher if they could do so. Because of these two incidents, the habituation period was reduced from 5 days to 4.

The video and audio recordings themselves also suggested that the children were habituated to the microphones. There were relatively few verbal and behavioral references to the microphones, and these tended to be comments by children from other classes (i.e., those not involved in the study), adjustments to the microphone if it had fallen off, or use of the microphone in play, for example, for an interview or singing. There were no incidents in which the child covered the microphone to say something or indicated that they could not say something because of the microphone. There were a number of occasions in which children from other classes pointed out that the child wearing the microphone had just been recorded saying something, but on each of these occasions the target child stated that it did not matter or that they did not care.

Data Collection

The audio transmitter was switched on, and the box was re-sealed before the microphone and waist bag were given to the target child. A stopwatch was started simultaneously to enable field notes to be synchronized with the videotape. Throughout the recording, the researcher made field notes recording the time on the stop watch, whether the subject was in range, who the subject was grouped or interacting with, and any additional relevant information that might not have been recorded on the video (e.g., speech or gestures from someone at a distance). Microphones were collected at the end of the lunch hour and equipment turned off in the staff room or researcher's car.

During dinner or when the child was inside during playtime, the researcher sat at the edge of the room in the best position possible to unobtrusively observe the target child. The rucksack was placed on a table with the camera pointing toward the child and could be swiveled around if the target moved out of range.

When the rucksack was being worn in the playground, the camera was set to point at an angle from the researcher. This enabled her to stand facing one direction while recording a child slightly to the left of her, making observation more discrete. The researcher stood or followed as close as was considered possible to the target child without him or her realizing he or she was being individually observed. This distance varied with the location and activity of the child. For example, it was possible to get closer to a group of children skipping than to a group of children playing football. It was also possible to stand nearer to a child when he or she was in a busy area of the playground than when, for example, he or she was alone or with one other child in an empty corner of the playground.

Care was also taken to ensure that it was not obvious that the child was being followed. Again, the degree to which this was considered possible depended on the number of other children present and the location. In some instances it was considered better to wait until the target came back into range or to wait a short period of time before following him or her in order to be discrete. Of the 77 target children recorded on video there was only one incident in which a child commented (correctly) that she thought the researcher was following her and her friend. In this case it was mentioned once only.

Ethical Issues

The study involving the audio and video equipment was approved by the researchers' departmental ethics committee before the pilot studies took place.

A letter giving details of the study was sent to all parents together with a consent form for them to fill in and return stating whether they did or did not wish their child to be involved. A total of 100 letters were sent out. Ninety-two of these were returned, 85 giving consent and 7 not giving consent[1].

The consent letters notified parents that their child would be video recorded if involved in the study. However, the participants were not informed of when or how this would take place. Previous research by the second author suggests that children do not habituate to a normal video camera even after a period of 6 weeks. The time constraints involved in the present research also meant that there was little time available solely for the purposes of habituation, i.e., it was necessary to carry out recording each day. For these reasons it was decided that children would not be told on which days they were being video recorded or where the video camera was located. As mentioned above, parental consent was obtained for the use of covert video recording, and this decision was approved by the ethics committee. The children were, however, aware that their behavior on the playground was being observed and recorded in field notes by the researcher.

The children were also aware that they were being audio recorded. Participants were asked on each occasion if they would wear a microphone, and the researcher did not insist that they wear one if they did not want to. The participants were also able to take off the microphones if they no longer wanted to wear them. From a total of 79 children who originally obtained

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[1]Of the 85 children for whom consent was obtained, 3 left the school before the study began and 3 did not return their consent forms until the study was almost complete and therefore were unable to take part. This left a total of 79 children. A further 2 children did not want to wear a microphone after the habituation period.

parental consent and agreed to wear a microphone, there were 2 children for whom no data were collected because they no longer wanted to wear a microphone before the end of the habituation period. All the data from individual children remained confidential and anonymous.

Data Generated

As discussed previously, the use of a remote audio transmitter and micro video camera enables researchers to code variables that would be difficult to access from report data. In addition, aggressive episodes may be coded and re-coded any number of times to obtain a wide range of data. For example, in the present study the variables coded for each act of aggression were context, antecedent, aggressor's sex and identity, victim's sex and identity, type of aggression, type of victim response(s), type of peer response(s), and number and sex of any peers present. The content of any verbal aggression or antecedent, together with the content of any remarks about aggression, were also transcribed.

Since aggressive exchanges did not have to be coded rapidly in situ, it also enabled researchers to use a very detailed coding scheme. For example, a total of 12 separate types of aggression were coded, 25 types of victim response, and 10 types of peer response. Such a detailed coding scheme allows for greater flexibility when analyzing the data since the categories can be collapsed in a variety of ways. For example, Table I shows the way in which aggression was coded and subsequently categorized. This method also enables researchers to build up a descriptive picture of the most frequently occurring aggressive interactions.

Comparisons With Pepler

As mentioned previously, Pepler and colleagues have also used a wireless microphone and video equipment to study aggression in the playground. However, they employed a standard-sized camcorder located in a classroom overlooking the playground. The small camera lens and portable video recorder employed in the present research offer a number of advantages over the equipment used by Pepler and colleagues.

First, as Pepler and Craig [1995] noted, they had some difficulties tracking target children, and a second researcher was required on the playground to ensure that the correct child was

TABLE I. The Coding Scheme Employed for Incidents of Aggression

Code	Category
1. Aggresses physically against victim	Direct physical aggression
2. Insults victim or calls victim a name	Direct verbal aggression
3. Expresses dislike toward victim	Direct relational aggression
4. Excludes victim from an activity	Direct relational aggression
5. Excludes victim from information	Direct relational aggression
6. Ignores victim	Direct relational aggression
7. Insults victim or calls victim a name in his/her absence	Indirect verbal aggression
8. Expresses dislike toward victim in his/her absence	Indirect relational aggression
9. Suggests to other(s) exclusion of victim from an activity in his/her absence	Indirect relational aggression
10. Suggests to other(s) exclusion of victim from information in his/her absence	Indirect relational aggression
11. Suggests to other(s) ignoring of victim in his/her absence	Indirect relational aggression
12. Reports victim to teacher	Other

observed. In the present study, only one researcher was required to operate the equipment and track the target child, and this proved to be an unproblematic procedure. Given the time-consuming nature of observational work, a procedure that requires one researcher rather than two has significant time and cost benefits.

Second, approximately 4% of Pepler and Craig's [1995] observations were lost due to the target child moving out of the field of view. In contrast, the portable nature of the equipment employed in the present study meant that children could be followed to all areas of the playground. This meant that more data could be collected in the time available. It also meant that children could be observed in more secluded areas of the playground (where aggression may be more likely to take place) and that the research was not restricted to schools with "open-plan" playgrounds.

Third, because all of the equipment used in the present study was portable, it meant that children could easily be observed in a wide range of contexts during the same day. For example, in the present study observations were not only made in the playground but also in the dinner hall at lunchtime, in the corridor as children queued to go into the dinner hall, and in the classrooms during lessons and wet playtimes. Observing children in a variety of contexts is critical since forms and levels of aggression have been shown to vary depending on the context [Craig et al., 2000; Olweus, 1993; Whitney and Smith, 1993].

Fourth, the equipment employed in the present study allows children to be video recorded at a much closer range than the equipment used by Pepler and colleagues. This is important for two main reasons: it allows individual children to be identified from the recordings and it allows gestures and facial expressions to be coded. Facial expressions are crucial since they are a means of distinguishing between aggression and rough-and-tumble play [Boulton, 1996]. Gestures and facial expressions are also important if children's responses to aggression are to be coded. For example, in the present study, peers smiled or laughed in response to approximately 14% of all acts of aggression.

Identifying children with whom the target child interacts ("peers") means that their acts of aggression can also be coded and analyzed with the child remaining as the unit of analysis. This is especially important when studying aggression since it is a relatively low-frequency behavior. Being able to identify peers also opens up a wide range of research possibilities. For example, research by Salmivalli et al. [1996] suggests that certain children tend to reinforce bullying behavior while others are more inclined to defend the victim. However, such an analysis is only possible in observational research if the children can be identified.

CONCLUSIONS

The remote audio transmitter and micro video camera employed in the present research offer two major advantages for studying aggression in school. First, they are an effective means of gaining observations of indirect and relational aggression that may frequently be too subtle for proximal observations. Second, this method allows detailed coding of variables that may be inaccessible by other methods. As Archer [1995] argued, a sound descriptive base is necessary for a full understanding of aggression. Despite this, there have been very few detailed observational studies of aggression in schools, and, perhaps as a result, little is known about the processes controlling these behaviors. This lack of research may in part be due to difficulties associated with observing and recording a large number of variables within the playground environment. However, as was demonstrated by the present research, the use

of a remote audio transmitter and micro camera enables the researcher to record behaviors that might otherwise be missed, as well as allowing him or her to code a large number of variables from the recordings. If we are to design effective interventions to reduce aggression in schools, detailed observations are essential. The technology described in this paper may help us achieve this goal.

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