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Peer separation in older Rhesus monkeys

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FIVE COLLEGE
DEPOSITORY

PEER SEPARATION IN OLDER RHESUS MONKEYS

A Thesis Presented

By

Robert Arnold Blume-Babcock

Submitted to the Graduate School of the
University of Massachusetts in partial fulfillment
of the requirements for the degree of

MASTER OF SCIENCE

March 1978

Psychology Department

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CHAPTER I

INTRODUCTION

Background

The literature on human clinical depression suggests that one environmental event which may precipitate reactive depression is separation from loved ones. Paykel (1973) reviewed the empirical literature on acute depression and life events and found several studies which provided some support for the proposition that separation events precede depression (Levi, et al., 1966; Paykel, et al., 1969) as well as several studies which do not support such a relationship (e.g., Hudgens, Morrison, & Barchha, 1967). Klerman (1974) summarized the evidence for the separation-depression hypothesis by noting that: (a) emotional losses and separations from loved ones do not precede all depression, (b) not all individuals who experience loss develop depression, and (c) loss may precede clinical conditions other than depression. Recent attempts to provide unified theories of human depression rely on environmental events, such as stress or separation, which may lead to biological changes in the "mechanisms of reinforcements" producing depression (Akiskal & McKinney, 1973; Akiskal & McKinney, 1975). However, the importance of emotional loss as an antecedent condition of reactive depression remains unclear.

This situation may obtain simply because hypotheses about the antecedent conditions of human depression are exceedingly difficult to test. Human depression rarely exists in pure form and operational definitions of depression vary from one study to another (Lewinshon, 1974). When

recently depressed persons report having experienced losses, it is often difficult to determine whether these events occurred prior to the onset of depression. For this reason the causal factors of depression are often difficult to separate from the effects of the disorder, (Mendels, 1970). Similarly, the finding that recently depressed patients report having experienced more separation events than do control subjects is difficult to interpret because the subject's recall may be distorted by the recent depression, (Paykel, 1973). Further, studies which search for the antecedent conditions of reactive depression in humans usually rely upon correlational approaches which cannot establish causal relationships.

Experimental manipulations which would establish the importance of separation from loved ones as an antecedent condition of depression in normal human subjects are clearly untenable. An alternative to studying depressed human subjects is to attempt to produce an animal model of the disorder in question. This approach involves studies which examine the reactions of nonhuman primates to environmental stresses which are thought to precipitate depression in human subjects. When aberrant behavior which is similar to that seen in depressed humans is produced in nonhuman primates by an experimental manipulation under controlled conditions, the experimental manipulation is suggestive as an antecedent condition for depression in humans.

Clearly, the usefulness of this approach depends upon species generality; monkeys are not human. In an effort to provide a basis for generalization between human and nonhuman primates, McKinney and Bunney (1969) outlined three conditions which should obtain before psychopathology

produced in nonhuman primates is considered to be parallel to psychopathology found in human primates. First, environmental events which produce the putative disorder in nonhumans should also produce the disorder in humans. Second, observable changes associated with the disorder in nonhumans should be similar to symptoms seen in humans who have the disorder, where objective criteria are agreed upon by independent observers. Finally, therapeutic manipulations which are effective in ameliorating the disorder in one species should be effective in the other, (McKinney & Bunney, 1969). The conditions for species generality outlined by McKinney and Bunney are applicable only to models of depression which are fully developed. One model of human depression which approaches these conditions is infant separation from the mother in humans and rhesus monkeys (cf. Bowlby, 1973). However, Harlow and Suomi (1974) suggested that concordance on any two of these criteria greatly increases the probability that concordance will be found on the third with sufficient investigation.

Reactive depression is a condition which affects many adults, but for the reasons given above, the importance of separation from loved ones as a precipitating factor in adult depression remains to be established. Considerable success in establishing an animal model for human depression has motivated a number of investigators to attempt to extend this model to adult depression by examining the response of older rhesus monkeys to separation from peers. The study proposed here is a clarification of the research on separation in adult rhesus monkeys and will be introduced by a review of the literature on the effects of separation in infant, juvenile, and adult rhesus monkeys.

Before examining the literature on separation in rhesus monkeys, it is important to note that no separation study in adult monkeys has established a consistent model of depression. In order to meet McKinney and Bunney's criteria, it is necessary to propose a set of observable behavioral changes which might be seen as depression in adult rhesus monkeys. Mendels (1970) described behavioral changes which are consistently seen with depression in human subjects. Excluding inferred changes and verbal statements often made by depressed persons, these symptoms include: (a) agitation or retardation in psychomotor behavior, (b) marked decreases (or more rarely increases) in food consumption, (c) restless sleep, (d) decreased sexual activity, (e) constipation, and (f) menstrual changes. Lewinshon (1974) described depression as a general decrease in the subjects' behavior. These behavioral changes can be observed in nonhuman primates and are therefore proposed as criteria for the interpretation of the results of this study in a clinical framework.

Separation Induced Depression in Infant Monkeys

Primate models of human depression have primarily focused on the hypothesis that separation from emotional attachment objects (i.e., loved ones) leads to depression. Within this paradigm, successful studies have been mainly limited to young subjects where maternal loss usually produces depression in several species. Seay, Hansen and Harlow (1962) and Seay and Harlow (1965) established that maternal separation in rhesus monkeys produces changes in the infants' behavior which resemble human depression. These changes were descriptively termed as the immediate "protest" response and the longer term "despair" response,

to correspond with patterns described for human children. In these studies, infant protest was observed immediately following maternal separation and was characterized by a dramatic increase in distress vocalizations and attempts to regain contact with the mother. Following an initial increase in these behavior patterns, the activity of the infants decreased dramatically. The infants were housed together during maternal separation. However, they did not engage in play or any of the complex social interactions which are normal for infants in feral groups. Reunion of mothers and infants initially produced intense positive mother-infant interaction. However, comparisons of two weeks pretest and two weeks of reunion observations indicated no significant change in mother-infant interactions as a function of separation, (Seay, Hansen, & Harlow, 1962; Seay & Harlow, 1965). Parallels between mother-infant separation-induced responses in infant humans and monkeys are evident in these studies (cf. Bowlby, 1973). Subsequent studies of maternal separation and infant-infant separation (discussed below) have demonstrated the importance of a number of variables in determining the response of the infant to attachment object loss. Major factors including species, the infant's age, the duration of separation, the social environment during separation, and the nature of the lost attachment object have been systematically investigated while numerous other potentially important factors, such as the infant's resources, have gained honorable mention in the absence of relevant quantitative data, (cf. Kaufman, 1973).

Species Differences

Jensen and Tolman (1962) established that brief (five minute)

separations and maternal exchanges in pigtail macaques (M. nemistrina) evoked strong protest responses in both mothers and their 5 to 7 month old male infants. When the infants were exchanged, they initially attempted to gain contact with the unfamiliar mothers. However, this behavior elicited rejection and the infants developed mother specificity with repeated exchanges, (Jensen & Tolman, 1962). Kaufman and Rosenblum (1967) removed the mothers of pigtail infants from a group housing pen and observed infant reactions which resembled the reports of Seay et al. (1962) and Seay and Harlow (1965). The behavior of the pigtail infants differed, however, in three important ways from the behavior of rhesus infants. First, only three of the four pigtail infants exhibited the despair pattern during four weeks of separation. Second, unlike the rhesus infants, the pigtail infants who did become depressed adapted to separation by the third and fourth weeks as indicated by play behavior which approached baseline levels. There were, however, periodic bouts of depression which persisted until reunion. Third, when the pigtail mother-infant pairs were reunited, the increases in social behavior between mothers and infants exceeded similar increases reported for rhesus mother-infant pairs following equal durations of separation, (Kaufman and Rosenblum, 1967).

Kaufman (1973) discussed the differences in separation induced reactions in pigtail infants and a closely related species (M. radiata). Data from a series of separation studies indicate that maternal separation may differ dramatically in its effects across these species under some conditions. In the above mentioned study, pigtail mothers restricted the

contact between their infants and other females prior to separation and further did not adopt infants who lost their mothers via separation. Thus, pigtail infants found little solace from distant relatives and concomitantly became depressed. In studies of maternal separation in bonnet macaques, infants have seldom shown the despair reaction. Infants who have lost their mothers have typically been adopted by other females who have established contact with all infants within the group prior to separation.

Infant sharing has been observed in female bonnets under a variety of housing conditions, (Kaufman, 1973). When pigtail macaques are housed in small groups, this is seldom observed to occur. However, observations of large groups of pigtail macaques indicate that this behavior may develop in subgroups or clans of pigtails, (Rosenblum, 1973). However, the importance of this factor in pigtail maternal separation has not been established. Further, unpublished data (Kaufman, Rosenblum, & Stynes mentioned in Kaufman, 1973) suggest that bonnet infants may not develop depression following maternal separation even if they are housed alone.

Schlottman and Seay (1972) reported a mother-infant separation study in irus macaques (M. fasicularis) where the separated subjects were either reunited immediately with their mothers, or housed for three weeks with substitute mothers, or housed for three weeks with peers. The subjects who experienced only a brief separation trauma were virtually unaffected while subjects who were not immediately returned to their mothers developed a reaction qualitatively similar to the rhesus infants' reactions to separation. Comparing the reunion data from this study to

the results of Seay et al. (1962), the authors suggest that irus infants recover from maternal separation (during the reunion period) more quickly than rhesus infants, (Schlottman and Seay, 1972).

Age at Separation

Suomi, Collins and Harlow (1973) examined the importance of age in determining the rhesus infants' behavior following maternal separation. Previous studies indicated that slight variations in the infants' ages, within the middle of the first year of life, had little effect on the severity of depression which could be produced. Suomi, et al. separated 12 pairs of subjects when the infants were 60, 90, or 120 days of age. Although the infants' behavior did not differ significantly as a function of age prior to separation, infants separated at 90 days of age exhibited a more severe immediate reaction (protest) than did infants separated at either 60 or 120 days of age. Suomi et al. suggested that the exacerbation of disturbance in 90 day old infants may be attributed to a recent maturation of the fear response (which occurs between 70 and 90 days of age), while similarities between the separation responses of 60 and 120 day old infants suggest that specific maternal recognition and attachment develop in the rhesus monkey prior to the development of fear, (Suomi, et al. 1973).

Environment During Separation

A number of mother-infant separation studies have demonstrated that the social environment infants experience following separation exerts an

important influence on the behavior patterns separation produces. In the irus monkey (Schlottman & Seay, 1972) subjects who were housed with peers were more severely affected by separation than subjects who were housed with adult females. Suomi et al. (1973, cited above) found the effects of maternal loss to depend strongly on whether subjects were housed with conspecifics. Infants who were housed individually following separation exhibited higher levels of self-directed behavior patterns and lower levels of locomotion (indicating depression) than subjects who were housed in pairs. Suomi, et al. note that the effects of individual housing are dramatic even when social separation is not a preceding condition. Chappel and Meier (1975) compared the effects of removing infant macaques from their home environment during maternal separation with the effects of removing only the mother from the social group. Although the design of the study prohibited quantitative comparisons of infant activity under the two separation conditions, removal of the mother produced the typical protest-despair response, while infant removal during separation produced only a protest response. Mother-infant interaction during reunion differed between groups in that infant removal lead to greater increases in ventral-ventral contact clinging than mother removal. Following infant removal separation, infants clung to their mothers more than the mothers cradled their infants. Following mother removal separation, maternal reciprocity increases. Chappell and Meier also concluded that mother removal separations disturbed infants more than infant removal separations, while, infant removal separations disturbed mothers more than mother removal separations, based on separation observations.

Suomi (1973) examined the effects of separating infants who were raised together without mothers in conjunction with vertical chamber confinement. Infants in this study were repeatedly separated and housed in vertical chambers which subjected the subjects to an extreme form of social and sensory deprivation.[1] All of the subjects in this study developed severe behavioral pathologies indicated by high levels of self-clasping and low levels of partner contact during reunion, in addition to the typical biphasic response pattern during separations. Subsequent studies (e.g., Suomi & Harlow, 1975) support the assertion that vertical chamber confinement exacerbates separation induced disturbance. However, little (if anything) is known about the specific features of this manipulation which are responsible for the observed changes in behavior. Thus, one is inclined to question the relationship between this nonsocial manipulation and socially induced behavior changes which are involved in both nonhuman and human reactive depression.

Other Attachment Objects

Social separation studies which establish depression in young monkeys are not limited to the mother-infant attachment bond. Suomi, Harlow, and Domek (1970) separated infants within together reared infant groups at 90 days of age. This procedure differed from previous separation studies in two major ways. First, the infants were separated from peers with

[1] For an account of the philosophy and mechanics of vertical chamber confinement, the reader is referred to Suomi and Harlow, 1969.

whom they had formed strong attachments; thus, subjects who were reunited following separation had all experienced the same trauma at the same point in their developmental timetables. Second, subjects in this study were repeatedly separated and reunited for short periods of time, (4 days of separation and 3 days of reunion) a total of 20 times. Suomi, et al. argued that infant-infant separation studies allow a clearer examination of infant subjects' reactions to separation and reunion than mother-infant separation studies because interactions between infants are more likely to change consistently across separations than interactions between mothers and infants. This is important, because infants who are attached to mothers experience maternal rejection during the first year of life. Infants who are attached to highly dependent infants do not experience maternal rejection. The results of this study indicated that infant-infant separation produces a biphasic reaction similar to that found in infants who are separated from mothers. Further, the effects of short term separations and reunions did not diminish over replications. During repeated separations, the behavior of the subjects remained impressively consistent. In addition, the authors compared the behavior of the repeatedly separated infants to normal maturation patterns for 3, 6, and 9 month old infants and found that the subjects in this study did not mature normally. Rather, neonatal patterns of behavior either intensified or remained constant over time, resulting in a "virtual arrest of maturation", (Suomi, et al., 1970).

Meyer, Novak, Bowman, and Harlow (1975) compared the responses of six-month old mother-reared infants and surrogate-peer-reared infants to

separation from their attachment objects. Separation in both groups produced an immediate protest reaction similar to that seen in other separation studies, further supporting the conclusion that the stressful nature of separation from "loved ones" is partially independent of the behavior of the attachment object. However, over the course of nine weeks of separation, significant differences developed in the infants' behavior. Separated surrogate-peer-reared infants engaged in more self play than separated mother-reared infants, while mother-reared infants engaged in more stereotyped behavior than surrogate-peer infants. Meyer, et al. also measured adrenocortical levels of both groups under repeated stress testing conditions during separation and found significant increases in stress-related hormonal assays prior to stress testing in mother-reared infants but not in surrogate-peer reared infants. Taken together, these findings indicate that separation from surrogates and peers is less traumatic than separation from mothers, (Meyer, et al.,1975).

Long Term Effects of Infant Separation

Spencer-Booth and Hinde (1971) examined the short- and long-term effects of separation in three groups of rhesus infants following reunion with their mothers. The subjects had either not experienced separation (controls), had experienced a single six day period of separation from their mothers at eight months of age (once separated), or had experienced two six day separations at 7 and 8 months of age (twice separated). All of the subjects were tested in a variety of situations 6, 12 and 24 months after their final reunions (or at corresponding time periods).

Six months after reunion, subjects who had experienced separation were less active in general, less involved in social play, and approached experimenters less often than subjects who had not experienced separation. By 11 months following reunion, twice separated infants were still less active than control subjects when their behavior was measured in the living cage. Twenty-four months after reunion, the behavior of the infants in the home cage testing situations did not differ significantly as a function of separating history. However, when the subjects were tested in unfamiliar surroundings, slight differences between controls and separated infants were detectable, (Spencer-Booth & Hinde, 1971).

Perspectives

Early attachment object separation is an important event in the life of young macaques. In rhesus and pigtail infants, separation usually produces protest reactions. However, the biphasic reaction which parallels human anaclitic depression depends upon a number of experimental variables ranging from the nature of the attachment object lost to the environment in which separation occurs. Individual studies of the roles single variables play in determining infant responses abound. However, the circumstances under which individual variables have been examined vary greatly from one study to another. Rosenblum (1976) has recently suggested that an environmental taxonomy would assist attempts at comparisons across studies. However, to date, none is available. For this reason, a comprehensive synthesis of the parameters of infant monkey depression is not forthcoming. However, studies of single variables have deeply probed

the effects of specific attachment object losses in specific environments providing solid empirical support for the assertion that social manipulations in nonhuman primates permit the generation of psychopathology which is amenable to rigorous control and study. Finally, utilizing much of the above mentioned information, researchers who focus on human anaclitic depression have successfully expanded our understanding of human mother-infant separation, (Bowlby, 1973).

The overwhelming success of previous studies in providing a model of infant depression and, questions as to the relationship between depression in human infants and reactive depression in juvenile and adult humans have lead to several attempts to determine whether social separations in older monkeys also produce some forms of depression. Human reactive depression is a relatively complex set of phenomena involving a host of factors in any given case. Although it is naive to believe that human and nonhuman primates are as similar in adulthood as they are in infancy, both species form strong emotional attachments during development. For this reason it is important to establish whether attachment object loss in older primates might reliably induce depression similar to some forms observed in human subjects.

Separation Induced Depression in Juvenile and Adult Monkeys

Attempts to produce depression in older animals have been only marginally successful in some cases and failures in others. Erwin, Mobaldi, and Mitchell (1971) observed like-sexed pairs of juvenile rhesus monkeys (6 males and 6 females) who were weaned at six months of age and

housed together until 2.5 to 3 years of age during three, two day periods; baseline, separation, and reunion. Separation was accomplished using translucent barriers. During the separation periods, the subjects developed protest reactions, including distress vocalizations. However, none of the subjects exhibited significant increases in self-directed behaviors (huddling, rocking, etc.) or decreases in environmental exploration or locomotor behavior which would have paralleled the biphasic reaction seen in infants. Comparisons of baseline and reunion observations indicated that other-subject directed behavior increased while environment-directed behavior decreased following separation. In addition, the immediate result of reunion was a short-lived period of high inter-subject distance. This detachment in reunion and the failure to find a biphasic reaction both differ from the results of most infant separation studies. Erwin, et al. note that the rationale for using 2 day separation periods is based on the finding that separation induced depression occurs in infants within 24-36 hours following maternal loss, (Erwin, et al., 1971).

Bowden and McKinney (1972) separated subjects from 3 adolescent male rhesus monkey pairs who were captured during the first year of life and paired for 6 to 8 months before the experiment. The authors generated behavioral categories on a post hoc basis; therefore, the strongest conclusion this study will support is that <u>if</u> separation had effects on the subjects behavior, the effects are of the form reported. The results suggest that separation leads to increases in cage-oriented behavior, alert postures, self-directed behavior, and locomotion which persisted until reunion. Initially, reunion was characterized by marked increases in sexual,

aggressive and grooming behaviors; however, only proximity and sexual behavior levels were significantly higher than baseline levels throughout reunion. In addition, clinically interesting nonsignificant findings in this study included inconsistent changes in food and water consumption during separation, inconsistent changes in stereotyped locomotion levels and stability of diurnal locomotion levels in all subjects throughout all conditions.

McKinney, Suomi, and Harlow (1972a) studied subjects in two groups of four three-year-old monkeys who had experienced four weeks of group housing. The experimental group was observed during four separation cycles, each consisting of two weeks of separation and one week of reunion. Separation was accomplished with opaque barriers which permitted only auditory and olfactory contact between the subjects. The control group was observed for comparable periods of time. The subjects' history included continuous mother-infant rearing, except for a three week separation study, during the first year of life and individual housing for one year prior to this study. Behavioral changes observed during separation included increased locomotion and environmental exploration over control and baseline levels. Also, the experimental subjects engaged in less environmental exploration than controls during reunion and the corresponding time periods respectively. Qualitatively speaking, McKinney, et al. reported that the subjects never exhibited signs of depression. Rather, the subjects' responses to separation were characterized by increases in stereotyped locomotion and repeated thrusts against the partitions separating them.

Each of these separation studies appears to support the conclusion

that juvenile rhesus monkeys do not develop any form of the separation induced depression that is seen in infant monkeys under similar conditions. However, this finding may depend more upon specific features of the experimental designs employed by Erwin, et al., Bowden and McKinney and McKinney, et al. than upon a total resistance to socially induced depression in older rhesus monkeys. Possible design flaws include the following. In terms of strength of attachment, interactions observed among formerly paired subjects during reunion following two years of separation (Erwin, Maple, Willott, & Mitchell, 1974) indicate that juvenile rhesus monkeys form strong social bonds based upon individual recognition if they are allowed over one year of group housing to form friendships. Little is known about the minimal time required for the formation of strong attachments; however, it is important to ask how familiar the subjects in the above studies were prior to separation. Bowden and McKinney (1972) paired their subjects for 6 to 8 months prior to separation and McKinney, et al. (1972) allowed only four weeks for attachment formation before separating their subjects. In the later study, the absence of a biphasic reaction to separation is probably the result of using an unstable social group, regardless of the effects of age. Erwin, et al.,(1971) allowed their subjects to form attachments over a period of 17 months prior to separation. This period of time is clearly adequate; however, the duration of separation employed (two days) may have been insufficient for the development of depression in older subjects. Infants separated from their mothers become depressed within 24-36 hours following separation (Kaufman, 1967). If the effect of age on the separation response pattern is simply to

extend the period of protest beyond two days, then this might explain the findings of Erwin, et al. Blume-Babcock and Novak (in preparation) examined long term separation in a stable social group of juvenile rhesus monkeys. The group consisted of two males and two females who were reared as peers with surrogates. The subjects experienced separation (Meyer et al. 1975) at six months of age and were housed together until the present study. In an attempt to produce depression, the subjects were separated for a period of 72 days by wire-mesh barriers in an experimental-living cage. The barriers allowed unlimited visual, auditory, olfactory contact and severely limited physical contact. Daily observations of individual and group behavior indicated that separation resulted in a uniphasic protest response characterized by increases in cage directed aggression, environmental exploration, self-directed behavior and stereotyped locomotion. Behavior patterns, such as self-clasp, huddling, rocking etc., which would have increased with depression did not. Following reunion, the subjects engaged in increased social behavior including grooming and sexual behavior. Thus, older rhesus monkeys appear to be resistant to long term wire-mesh separation induced depression.

Several studies have successfully produced psychopathology in older subjects. McKinney, Suomi, and Harlow (1972b) examined the effects of nine days of wire-mesh separation and 10 weeks of vertical confinement upon the behavior of an experimental group of four three-year-old-rhesus monkeys. Behavioral observations of the experimental group following separation and confinement were compared to observations of a control group which lived together as a group during a corresponding time period.

The subjects had been reared with mothers and peers and had all experienced three weeks of separation during the first year of life. Significant behavioral changes in the experimental group following reunion were reported in three major categories: Contact-cling, locomotion, and passivity. Following confinement, the experimental subjects engaged in more contact cling and less locomotion than they had prior to the manipulation. Further, passivity levels increased above baseline during part of the reunion period. The experimental subjects also engaged in more contact cling and less locomotion than did control subjects during a corresponding time period. This study demonstrated that concomitant separation and confinement produces severe behavioral changes. Long periods of contact clinging and passivity are unusual in three year old rhesus monkeys, and McKinney, et al.,(1972b) suggested that these behavioral changes might be termed regressive. Unfortunately, while this study produced psychopathology, it failed to differentiate between the effects for separation and the effects of vertical chamber confinement. The use of a separated control group would have done so. Comparing the results of this manipulation with the results of other studies (e.g., Blume-Babcock & Novak) it is possible to suggest that the confinement and not the separation were responsible for the observed changes in behavior. However, this suggestion still leaves considerable question as to the specific nature of the manipulation which is responsible for these changes.

Patterson and Seay (1975) recently subjected 4 adolescent java monkeys (Macaca fasicularis) to vertical chamber confinement for a period of 28 days. The subjects were familiar mother-peer reared males and females who

were individually housed, with one hour of interaction per day, prior to incarceration. Observations were taken during a nine day baseline period, a 28 day period of incarceration, a nine day reunion period, and a nine day follow up period (commencing 69 days after the incarceration ended). The subjects' behaviors were highly variable during the incarceration period. Changes included increases in stereotyped behavior for all subjects during the first 13 days, and increased passivity for one male and one female. Immediately following incarceration, the subjects engaged in more grooming, lipsmacking, and social contact and less locomotion and environmental exploration than was observed during the baseline interaction periods. Post-incarceration levels of rocking, huddling, stereotypies, distress vocalizations, etc. were minimal indicating that incarceration did not produce prolonged disturbance in these subjects. Food and water consumption levels were monitored throughout the study and significant decreases in food consumption were reported for the incarceration period. However, the authors suggested that these decreases were not extreme enough to indicate that the subjects suffered from protein deprivation induced depression. Patterson and Seay suggested that while these subjects responded differently to confinement than the subjects studied by McKinney, et al., (1972b) the difference should not necessarily be considered a species difference. The subjects in McKinney, et al. had experienced separation induced depression during infancy while the subjects in this study had not.

The importance of early experience in determining adolescent subjects' response to separation was established by Young, Suomi, Harlow, and

McKinney (1973) who compared the responses of two groups of two year old rhesus monkeys to repeated daily separations. The two groups were treated identically and differed only with respect to rearing conditions. The experimental subjects were surrogate-peer reared and had experienced 30 days of vertical chamber confinement between 5 and 10 months of age. The control subjects were mother-peer reared and had not experienced confinement prior to this study. The groups differed drastically in their responses to separation. The experimental subjects engaged in significantly higher levels of self-clasping, rocking, and huddling behaviors while the control subjects engaged in more stereotyped and locomotor behavior during separation. The patterns observed in the experimental subjects during separation resemble infant responses to vertical chamber confinement while the patterns observed in the control group resemble and uniphasic protest response reported in other studies. For this reason, Young, et al., (1973) suggested that separation unmasked patterns which had developed during ontogeny in the experimental group. This fits well with theories of human depression which differentiate depressive persons from normals on the basis of predisposing factors involving early experience.

McKinney, Kliese, Suomi, and Moran (1973) studied the behavior of both adult subjects (four years of age) and juvenile subjects (two years of age) who had experienced prior vertical chamber confinement and age mate controls. The adult subjects had been chambered for 90 days at three years of age, and the juveniles had been chambered for six weeks at six months of age. Each resulting group of subjects was divided into two subject groups who were either chambered for a second time,

initially chambered, or not chambered during the present study. The results reported can be summarized as follows: (a) Prior to the current chambering, subjects who had been chambered either at six months of life or at three years were less social than subjects who had never been chambered. (b) Current chambering resulted in reduced environmental exploration during eight weeks of post incarceration observations. Contrasting the results of this study with those of Young, et al., (1972), the authors suggested that vertical chamber confinement and later social separation constitute a high risk series of events while vertical chamber confinement alone does not. The nature of this distinction remains to be elucidated.

One study, to date, has succeeded in inducing depression in adult monkeys via social separation. Suomi, Eisele, Grady, and Harlow, (1975) separated 6 male and 4 female adult (5 years old) rhesus monkeys and housed each subject in one of three conditions. Two male and 2 female subjects who were reared together from birth were housed as a group (familiar subjects), 2 male and 2 female subjects who were reared as pairs were housed together as another group (mixed subjects), and 2 males were separated and housed in social isolation, where they could see and hear but not physically contact conspecifics. During separation, the behavior of the mixed and familiar group housed subjects changed little while the subjects in isolation engaged in higher levels of stereotyped behavior, self-clasping, and lower levels of self-grooming. Immediately following reunion, inter-family hostility was high. However, most behaviors returned to baseline levels except in one of the subjects who had been housed in isolation. Prior to separation he had been highly

social; however, following this manipulation he remained passive, and engaged in high levels of self-clasping long after the other subjects had adjusted. In addition, both males were sexually active before separation and both became sexually inactive following reunion. Suomi, et al. suggested that these results are inconclusive owing to the small number of subjects involved. However, they offer a hint as to what manipulations might best be employed to produce depression in adult monkeys. In light of the mixed results of these studies, it is important to consider which aspects of separation and vertical chamber confinement are responsible for the induction of depression. The aspects of vertical chamber confinement which are responsible for the induction of psychopathology remain to be specified. This is a complex manipulation which, in addition to limiting physical space and general visual stimulation, completely eliminates visual contact between conspecifics. Separation studies in older subjects which have failed to induce depression have failed to eliminate all forms of physical contact. One major difference between the separation condition in Suomi, et al., (1975), which induced depression in one subject, and the separation condition in Blume-Babcock and Novak, which failed to induce depression, was that the former study deprived the subjects in question of any form of physical contact with peers while the later study failed to do so. In order to evaluate the importance of peer contact during separation, it is necessary to contrast different forms of separation in a single study. To date, this has not been done with older subjects. For this reason, the following study is

proposed. Subjects who are unquestionably familiar, and who have failed to develop depression during long term separation as juveniles will be repeatedly separated using wire mesh barriers, clear plexiglass barriers (which will eliminate physical contact), and opaque metal barriers (which will further eliminate visual contact between peers) in a design which should both minimize carry over effects of repeated separations and allow for the measurement of the effects of repeated separations. For the purpose of this study, depression (despair), if it occurs, should consist of marked increases in passive and disturbance behaviors (e.g., passive stereotypic behavior, visual exploration) and marked decreases in tactile/oral exploration, self grooming, self directed sexual behavior, locomotion and dominance display behaviors.

C H A P T E R II

METHOD

Subjects

The subjects for this study were eight 4½ year old rhesus monkeys, four male and four female reared form birth without mothers and with continual contact with surrogates and daily contact with peers for the first six months of life. The experimental subjects were separated from surrogates and peers for seventy-two days at six months of age (Meyer, et al., 1975). Following this separation, they were housed as a group until 3½ years of age when they were subjects in a separation study lasting eighty days. During separation, the subjects lived in the experimental-housing cage under wire-mesh separation as described below (Blume-Babcock and Novak). Following reunion the subjects lived undistrubed for a period of 11 months in the experimental-housing cage. The control subjects were continuously housed as a stable social group in a large home cage since six months of age.

Apparatus

The control subjects were housed in a large home cage which provided a living space 116 inches high by 58 inches wide by 61 inches deep. The experimental subjects were housed in an experimental-housing cage which provided a group living space 29 inches high by 48 inches wide by 60 inches deep. The group living space was partitioned into four individual quadrants, each 29 inches high by 29 inches wide by 23 inches

deep, by the insertion of wire mesh or clear plexiglass or opaque metal barriers. Opaque barriers were supported by wire mesh barriers. Observations were taken using either 8 inch by 16 inch observation ports from adjoining rooms or a Sony video camera DVC-2400 DC12V equipped with a Sony TV zoom lens f=16-64mm connected through a Sony camera adaptor CMA-2 to a Sony Videocorder TCV-2110A monitor unit.

Vocalizations were automatically recorded every 90 minutes throughout the day and night, for 2½ minutes. The timer used was a BRS/LVE Interval timer TI-907/253-11 driven by an Epsco EF filtered DC power supply set at 24 volts. The timer and power supply were monitored daily for accuracy. The timer powered a 110 volt AC relay which powered a Superscope C101 Cassette Deck connected to a Sony F26S Cardioide microphone suspended approximately 2½ feet above the center of the experimental-housing cage. Recordings were made using Scotch Dynarange 90 minute cassette tapes. With the exception of the camera and microphone, all recording and monitoring equipment was housed in a room adjacent to the room containing the experimental subjects.

Tapes of the vocalization observations were replayed over a Pioneer SX 1000 TW amplifier at half volume through two Pioneer CS 77A speakers. Pencil and paper scoring systems were used to record the vocalization and observational data. Sample scoring systems are provided in Appendix A.

Procedure

The study included nine days of baseline when subjects were group

housed in the unpartitioned experimental-housing cage, three 9 day periods of wire mesh barrier separation, three 9 day periods of clear plexiglass separation, three 9 day periods of opaque separation, nine 3 day reunion periods, (one followed each 9 day period of separation) and an eighteen day post test period.

Order of presentation. In order to control for carry-over effects of separation, separation periods were presented in a latin square selected according to the methods described by Fisher and Yates (1955). In addition, each separation period was followed by three days of group housing. A schematic of the design is presented in Table 1. All changes (from separation to group housing or from group housing to separation) occurred between 9:30 a.m. and 10:00 a.m. and observations were taken on change days after the subjects had been in the new condition 30 minutes. Cage positions were randomly determined prior to separations with the condition that no subject could be housed in the same position during two consecutive separation periods.

Observations. Modified frequency observations of individual behavior patterns, absolute frequency observations of group interactions, absolute frequency observations of group vocalizations, and individual water intake and food intake observations were collected in this study.

Observations of each experimental subject's behavior were taken daily between 10:00 a.m. and 10:30 a.m. throughout the study. A modified frequency scoring system was used, where the presence or absence of each of thirty-six behavior patterns was noted during each

to the subjects. Behavior patterns were monitored using either observation windows or the videotape equipment described above. Interaction observations of the control subjects were taken by observers who postitioned themselves within full view of the subjects. Reliability estimates between control and experimental interaction observations were not directly established. However, all observers met strict laboratory reliability criteria of greater than 90 percent concordance with highly trained observers.

Vocalization recordings were scored using an absolute frequency count of each of 4 vocal patterns for each 2½ minute session. All vocalizations could be reliably perceived as different degrees of these categories and were included under the appropriate heading. A sample scoring sheet is provided in Appendix C and definitions of the vocal patterns are provided in Appendix B. Food and water consumption were monitored for each subject during each separation condition. The subjects were maintained on 2.7 liters of water and 165 grams of Purina monkey chow. Water bottles were changed three times per day and the water remaining in the bottles at changing times was measured to the nearest deciliter and recorded. Food was administered in measured amounts once per day and any remaining food pellets were counted, recorded, and the amount of food given was reduced in order to assure that approximately 165 grams of food remained available per day. Note that group housing precluded the accurate measurement of individual food and water consumption. Therefore these measures were taken only during the separation conditions.

15 second interval of a five minute observation period. Fifteen second intervals were marked for the observer by a beeper (tone generator) which signaled the change of scoring intervals on the data sheets. The data obtained from these observations were pooled into sixteen general categories of behavior which were used in the analyses. The groupings of behavior patterns are presented in Appendix B. Reliability estimates for each general category are presented below. For each day, the order in which individual subjects were observed was randomly determined.

Interactions among the experimental subjects were observed on the third day of each reunion period between separations and on the first, third, sixth, and ninth days of the pre-test and post-test periods as well as on the first, third, sixth and ninth days of an additional nine day post-test period which began nine days after the reunion following the final separation period. Interactions among the control subjects were randomly chosen in a similar time frame. Like modified frequency observations, interaction observations were taken in five minute blocks for each subject. However, the subjects served as focal animals and the partners with whom the focal animals interacted were counted, yielding absolute frequency data. Interaction observations of the experimental subjects began immediately after modified frequency observations. Control subjects were observed between 9:00 a.m. and 12:00 a.m. approximately one year prior to the present study when these were matched in age and group composition to the experimental subjects.

For both modified frequency and interaction observations of the experimental subjects, the observers were positioned in rooms adjacent

to the subjects. Behavior patterns were monitored using either observation windows or the videotape equipment described above. Interaction observations of the control subjects were taken by observers who postitioned themselves within full view of the subjects. Reliability estimates between control and experimental interaction observations were not directly established. However, all observers met strict laboratory reliability criteria of greater than 90 percent concordance with highly trained observers.

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Data Analysis

Daily modified frequency observations were grouped into four categories prior to statistical analysis: pre-test and post-test observations (Pre-post), observations taken on the first day of each separation condition (First day), observations taken on the second through the ninth days of each separation condition (Longer-term separation), and observations taken on the three day reunion conditions between each separation period (Reunion). A fifth grouping included observations taken during separation and observations taken during reunion periods (Wire, clear, opaque barrier separation vs. reunion).

Pre-post observations were analyzed using a one between, two within analysis of variance for repeated measures with sex as the between subjects variable and conditions (pre- vs. post-) and days as the within subjects variables. First day observations were analyzed using a one between-, three within-subjects analysis of variance for repeated measures with sex as the between-subjects variable and separation conditions, replications and days as the within-subjects variables. Longer term separation observations were analyzed using a one between-, three within-subjects analysis of variance for repeated measures, similar to the first day analysis. Reunion observations were also analyzed using a similar design with sex as the between-subjects variable and preceding separation condition, replications and days as the within-subjects variables.

Separation vs. reunion observations included all modified frequency

observations taken except for those taken during the pre-test and post-test periods. Hence this analysis was not orthogonal to the above. These observations were analyzed to specifically assess the effects of all four conditions of the experiment. Therefore, they were analyzed using a one between- (sex) and one within- (conditions) subjects analysis of variance, summing over repeated measures.

The conceptual separation between responses to separation observed on the first day versus responses to separation observed on the second through the ninth day was adopted a priori in an effort to eliminate the adaptation responses of the subjects to gross changes in their environment from consideration in the examination of their longer term responses to separation, without resorting to further post hoc tests.

Recorded vocalization observations were scored and then analyzed using three analysis of variance designs. The first examined separation period observations only, the second examined reunion period observations only, and the third examined observations from both the separation periods and the reunion periods. All analyses examined three within-subjects variables, conditions, replications and days. The design of the study precluded recognition of individual subjects. Therefore, in each analysis, the conditions main effect was evaluated by assuming the variability among replications to be randomly distributed for each condition. Using this assumption, the error term for the conditions main effect was the conditions by replications interaction.

Interaction observations of control and experimental subjects were

analyzed using a two between-subjects analysis of variance with groups and sex as variables. Water consumption data were grouped as first day of separation and longer term separation data and, were analyzed in the same fashion as the modified frequency observations. Food consumption data were not analyzed statistically. Decreases in food consumption occurred very infrequently during separations and the data are discussed directly in the results section.

C H A P T E R III

RESULTS

Pre-post

Pre-post comparisons indicated that few behavior patterns changed systematically from the baseline observations to the post-test observations, suggesting that the long-term effects of the series of repeated separations and reunions were minimal. Belly presenting behavior levels were significantly higher during the post-test period ($F(1, 2) = 31.98$, $p < .05$). Self groom levels varied daily, but not systematically prior to the study. Following the last separation, self-grooming levels were initially low and they increased steadily towards the end of the post test period, except for the last day, resulting in a pre-post by days interaction ($F(8, 16) = 3.66$ $p < .05$).

Several other behaviors varied over the pre-post test periods in non-systematic ways. Daily fluctuations during the pre-test period appeared to account for significant pre-post by days interactions for social contact ($F(8, 16) = 3.20$, $p < .05$), social groom ($F(8, 16) = 3.74$, $p < .05$), and dominance display behavior ($F(8, 16) = 2.75$, $p < .05$). Visual exploration also varied in a pre-post by days interaction ($F(8, 16) = 3.54$, $p < .05$), occurring least frequently on the eighth day of the post-test period.

Other behavior patterns varied significantly, but not as a function of the separation series. Tactile/oral exploration occurred most frequently on the first two days of both periods ($F(8, 16) = 5.22$, $p < .005$). Visual

exploration also varied with sex and days (F (8, 16) = 3.02, $p < .05$), occurring more in males during the early days of both periods and occurring more in females during the last three days of both periods.

First Day

The subjects' behavior on the first day of separation varied directly with the severity of separation. Three categories of protest behavior occurred with increases in the degree of restriction. Both locomotion and visual exploration occurred most frequently during opaque barrier separation (F (2, 4) = 12.03, $p < .025$; F (2, 4) = 21.74, $p < .01$). Active stereotypic behavior increased with the severity of separation for male subjects but not for females, see figure 1, (F (2, 4) = 16.08, $p < .025$). Taken together, these findings indicate that severe separation produced an initial overall increase in activity.

Replications produced changes in the differential effects of separation conditions for three behavioral categories. Agonistic behavior, occurred primarily in females during wire-mesh condition, see figure 2, (F (4, 8) = 17.30, $p < .001$). Tactile/oral exploration (F (4, 8) = 5.72, $p < .025$) and passive stereotypic behavior (F (4, 8) = 6.31, $p < .025$) were highest in wire-mesh rather than the clear or opaque barrier separation during the first replication. However, the converse was true during the third replication. The initially high levels of tactile/oral exploration and passive stereotypic behavior produced by the first wire-mesh separation may have been a function of the order in which the conditions were presented. Although the subjects were familiar with wire-mesh separation prior to

this study, the first replication of wire-mesh separation was the first incarceration the subjects experienced following a period of eleven months of group housing.

Longer-term Separation

In general, longer-term separation failed to yield changes in behavior resembling the strong depression response observed consistently in separated infants. However, separation conditions produced different responses, especially in the case of agonistic behavior. The initial increases in activity observed on the first days of opaque separation were not observed during longer-term separations. Tactile/oral exploration varied over conditions however, tactile/oral levels appeared to be highest during the clear barrier condition and lowest during the wire-mesh barrier condition ($F(2, 4) = 10.40$, $p < .05$). Self grooming and scratching levels decreased over days more during opaque separation than during the other conditions, see figure 5, ($F(14, 28) = 2.14$, $p < .05$). Vocalizations varied in a significant sex by conditions by replications interaction ($F(4, 8) = 4.80$, $p < .05$). As figure 6 illustrates, males vocalized more than females during separation. Further, male vocalizations decreased over replications of opaque and clear barrier separation while they first increased and then decreased over replications of wire-mesh separation. Also, the decreases observed during opaque separation appeared to be greater than those observed during clear barrier separation.

Differences between the contact allowed by the separation conditions produced several changes in interactive behavior patterns observed in

individual subjects. Agonistic behavior varied with conditions and days (F (14, 28) = 4.50, $p < .001$). As figure 7 illustrates, agonistic behavior occurred most frequently on the fourth, fifth, seventh, and eighth days of wire-mesh separation. Lower levels of agonistic behavior were also observed on the seventh, eighth and ninth days of clear barrier separation. Agonistic behavior observed during clear barrier separation consisted of threat postures and vocalizations. In wire-mesh separation, agonistic behavior included threat gestures, vocalizations and physical contact. This contact took the form of finger thrusts through the mesh and mouth fighting where the subjects faced each other and gnashed their teeth, inflicting minor cuts and lesions.

In spite of experimental plans, the subjects maintained limited physical contact during clear and opaque barrier separation by reaching through small spaces between the barriers. Attempts to eliminate these spaces proved fruitless. Thus, limited forms of social contact and social play occurred throughout the study. Social play occurred when contacts between the subjects were accompanied by jumping and/or approach-withdrawal movements. Virtually all social contact observed between male subjects occurred during wire-mesh separation. Females engaged in the highest levels of social contact on the eighth days of wire-mesh and opaque barrier separation, see figure 8, (F (14, 28) = 2.29, $p < .05$). Interestingly, females exploited the opportunities for social contact more during opaque separation than during clear barrier separation. Social play was also observed almost exclusively in females on the seventh day of opaque separation (F (14, 28) = 6.60, $p < .001$). Because the physical contact

involved in social contact and social play behavior patterns during opaque separation was very limited in the form it could take (the spaces between the barriers measured approximately 1.5 by .75 inches) it may be unwise to interpret these behaviors as being strictly affiliative. The occurrance of both contact and agonistic behavior in the less restrictive wire-mesh condition suggest that social contact and social play scored during opaque separation may have been vestigial forms of both affiliative and agonistic behavior patterns.

Social groom and groom presenting behavior occurred primarily during wire-mesh separation and varied over replications and days ($F (28, 56) = 2.07$, $p < .025$). As figure 9 suggests, grooming peaks occurred later during wire-mesh separation with each replication.

Several behavior patterns varied in interactions which were independent of separation conditions effects. Self grooming and scratching levels varied in a significant replications by days interaction which appeared to reflect a relative decrease in daily fluctuations during the second replication of all conditions ($F (14, 28) = 2.63$, $p < .025$). Female subjects engaged in more tactile/oral exploration than males ($F (1, 2) = 144.71$, $p < .01$). Finally, locomotion levels varied over replications and days ($F (14, 28) = 2.69$, $p < .025$). As figure 10 suggests, locomotion levels exhibited a pattern of daily fluctuation which changed with replications of separation. Differences between the high levels of locomotion observed on the eighth day of the first and the second replications and the lower levels of locomotion observed on the eighth day of the third replication probably account for this finding.

Reunion

Strong social interactions occurred during the reunion periods. The subjects immediate responses to reunion (within one hour) were similar throughout the study and consisted of brief bouts of sexual activity followed by longer bouts of grooming behavior followed by play behavior among males. Approximately one hour after the barriers were removed the sex-groom-play sequence gave way to other forms of behavior changing the overall pattern from one of "pure" forms into normal chaotic group interactions.

First day observations were always delayed thirty minutes following the removal of the barriers, and usually began while the subjects were involved in grooming behavior. Differences between the behavior observed on the three days of the reunion periods are illustrated in figure 11. In general, grooming levels were very high on the first day of reunion and they dropped on the second day and increased again on the third. Two exceptions to this pattern resulted in a significant conditions by replications by days interaction ($F(8, 16) = 8.28$, $p < .001$). After the first replication of opaque separation, grooming continued at higher levels than usual on the second and third days of reunion. After the first replication of wire-mesh separation, grooming failed to occur on the first day observations. On the second day of this period, grooming appeared at the normal second day level and on the third day grooming increased to levels normally only seen on the first day of reunion. Dominance display behavior varied with sex and days ($F(2, 4) = 8.38$, $p < .05$), see

figures 11 and 12. Males engaged in more dominance display behavior than females and dominance displays occurred least frequently on the first day of reunion when the subjects were primarily engaged in grooming. Visual exploration occurred least frequently on the first day of the reunion periods ($F (2, 4) = 12.80$, $p < .025$) as did tactile/oral exploration ($F (2, 4) = 17.70$, $p < .025$).

Clear effects of the preceding separation conditions on reunion behavior appeared in four behavioral categories. In general, opaque separation resulted in lower reunion levels of exploration and higher levels of agonistic behavior than the other separation conditions. As figure 13 illustrates, first day reunion levels of tactile/oral exploration were lowest following opaque barrier separation and second day reunion levels were highest following clear barrier separation ($F (4, 8) = 5.12$, $p < .025$). As figure 14 suggests, locomotion levels observed on the second day of reunion were higher following wire-mesh and clear barrier separation than following opaque barrier separation ($F (4, 8) = 9.73$, $p < .005$). Males engaged in self-directed sexual behavior least frequently following opaque separation while females did not show self directed sexual behavior during reunion, see figure 15 ($F (2, 4) = 7.01$, $p < .05$). Agonistic behavior also varied with sex and preceding conditions, see figure 16, ($F (2, 4) = 8.38$, $p < .05$). Males engaged in very low levels of agonistic behavior following all conditions of separation. Females engaged in slightly more agonistic behavior following opaque separation than following wire-mesh or clear barrier separation. Further, agonistic behavior occurred more frequently in females following wire-mesh separation than following clear

Wire-mesh, Clear Barrier and Opaque Barrier Separation Versus Reunion

Not surprisingly, the analysis of overall condition effects revealed significant differences among separation conditions and reunion which were mainly a result of social versus non-social housing. Locomotion levels were higher during reunion conditions than during any separation condition ($F(3, 6) = 13.33$, $p < .01$). However, differences in the horizontal space allowed in separation and reunion conditions may account for this difference. Social groom ($F(3, 6) = 76.51$, $p < .001$), social play ($F(3, 6) = 35.23$, $p < .001$) and belly presenting behavior ($F(3, 6) = 12.07$, $p < .01$) occurred more frequently during reunion than during any of the separation conditions. Visual exploration ($F(3, 6) = 8.67$, $p < .025$) and self grooming ($F(3, 6) = 4.96$, $p < .05$) occurred least frequently during the reunion periods. However, the meaning of the self groom effect is unclear because self grooming behavior also decreased non-significantly with severity of separation in the longer-term separation analysis.

Sex differences also appeared in the analysis of several behavior patterns. Males engaged in significantly more belly presenting behavior during reunion than females and male belly presenting behavior levels were highest during reunion ($F(3, 6) = 23.53$, $p < .005$). Females, again, engaged in more tactile/oral exploration of the environment than males ($F(1, 2) = 70.53$, $p < .025$) and males engaged in more active stereotypic behavior than females ($F(1, 2) = 95.78$, $p < .025$).

Control Versus Experimental: Interaction Observations

barrier separation suggesting a very slight carry-over of the increased agonistic behavior observed during the wire-mesh separation conditions. However, the levels of agonistic behavior observed during the reunion periods were very low (compare figure 16 with figure 2) compared to levels of agonistic behavior observed during separation.

In addition, replications of separation produced changes in the social behavior observed during reunion periods. Figure 17 illustrates a sex by replications interaction for social play ($F(2, 4) = 45.86$, $p < .005$). Reunion levels of social play were lowest for males and females following the first replication of separation. Social play levels peaked for females following the second replication and decreased following the third. Social play in males increased less dramatically from the first to the second replication and changed little from the second to the third replication. Belly presenting behavior varied in an enigmatic interaction of sex, preceding conditions, replications and days ($F(8, 16) = 3.38$, $p < .025$). As figure 18 illustrates, only males engaged in belly presenting behavior during the reunion periods. Belly presenting occurred following only the first and second replications of wire-mesh and opaque barrier separation while it occurred following only the first and third replication of clear barrier separation. Daily variations appeared to be non-systematic.

An additional finding, which was not related to the effects of the separation conditions, was that females engaged in more tactile/oral exploration than males ($F(1, 2) = 41.95$, $p < .025$). This was consistent with the sex difference found in tactile/oral exploration in the longer term separation analysis above.

Observations taken on the experimental group during the pre- and post-test periods as well as on the third days of each reunion period were combined and compared with observations taken on age matched control subjects over a similar time period. The control subjects were observed approximately one year prior to the present study as described above. Eight categories of interactive behavior were observed: social play, social contact, social groom and groom present, belly present, sex mount and sex present, agonistic behavior, displacement, and moan-lipsmack. Only social contact and agonistic behavior varied significantly across groups. Control subjects exhibited more social contact than experimental subjects (control $\overline{X}$ = 4.65, experimental $\overline{X}$ = 1.575 ($F(1, 2) = 23.26$, $p < .05$). The experimental subjects exhibited more agonistic behavior than the control subjects ($F(1, 2) = 83.72$, $p < .025$). Further, agonistic levels varied as a function of group and sex ($F(1, 2) = 129.29$, $p < .01$). Figure 19 presents the means for control and experimental males and females during pre-test, reunion, and post-test observations. It is clear that pre-test agonistic levels are similar in both groups and that part of the significance of this interaction is due to the increase in the agonistic behavior of experimental group females during the post-test period. In addition, control males appeared to engage in higher levels of agonistic behavior than control females while the converse was true in the experimental group. Although it seems possible that the difference in time between the two sets of observations could account for part of the significance of this interaction, it appears that the experimental group females became more aggressive as a function

of the present study (see figures 4, 10, and 16).

Vocalization Recordings

Longer term separation. Three vocalization patterns decreased in absolute frequency with increases in the severity of separation: Bark/grunts ($F(2, 4) = 18.11$, $p < .05$), clucks ($F(2, 4) = 10.09$, $p < .05$) and total vocalizations ($F(2, 4) = 31.97$, $p < .005$). Bark/grunts were clearly higher in wire-mesh separation than in any other condition, a finding which is consistent with the increases in agonistic behavior reported above for first day and longer term separation. Bark/grunts are typically employed by rhesus monkeys as a vocal component of threat gestures.

Reunion. Vocalization frequencies failed to change significantly as a function of preceding separation conditions during the reunion periods.

Wire-mesh, clear barrier, and opaque barrier separation versus reunion. Clucks and total vocalization frequencies varied significantly across conditions ($F(3, 6) = 7.88$, $p < .05$, and $F(3, 6) = 9.44$, $p < .05$). Wire-mesh separation appeared to increase these vocalizations while opaque barrier separation appeared to decrease them. Figure 20 illustrates the absolute frequency levels of bark/grunts and clucks under each of the four conditions. Although bark/grunts were not significant in the present analysis, it is clear that the increase reported during wire-mesh separation, above, was substantially above reunion levels.

The recorded vocalization data were analyzed using an adaptation

of the analysis of variance to a completely within subjects design which did not require data from individual subjects. This adaptation required the assumption that replications could be used as a randomly distributed error component. Hartmann (1974) and others have argued that such adaptations are at best approximate. For this reason, the significance levels attached to the above findings are merely suggestive. At best, these data suggest that increases in the severity of separation produced decreases in vocal behavior and that agonistic vocalizations occurred with other forms of agonistic behavior, reported above, during wire-mesh separation.

Water Consumption

First day. The subjects water consumption varied in only one respect on the first day of separation. The third clear barrier separation replication appeared to reduce water consumption more than any other separation ($F(4, 8) = 5.00$, $p < .05$). This change was especially notable in one female who also failed to consume all of the food offered her that day.

Longer-term separation. Changes in water consumption during separation were reflected in a sex by conditions interaction ($F(2, 4) = 7.25$, $p < .05$), a conditions by days interaction ($F(14, 28) = 4.02$, $p < .01$), a replications by days interaction ($F(14, 28) = 3.61$, $p < .01$) and a conditions by replications by days interaction ($F(28, 56) = 2.29$, $p < .01$). Although the later three interactions were statistically reliable, owing to the high number of degrees of freedom associated with the days term

in each interaction, they failed to yield any consistent trend in daily changes which supported a strong influence of separation conditions or replications. The sex by conditions interaction suggested that water consumption in females was more effected by clear barrier separations than by other forms of separation while males were not differentially effected in their water consumption by any separation condition.

Food Consumption

Only one subject failed to consume all of the food provided during the study. On the third and sixth days of the second replication of wire-mesh separation and on the sixth, seventh and ninth days of the second replication of clear barrier separation, Scarlet, a dominant female, failed to consume 14, 7, 56, 193, and 70 grams, respectively, of her daily food allotment. Because these data involve only one subject, they were not analyzed statistically. Although it is possible these lapses in food consumption were due to separation they may also be accounted for by mild illnesses which periodically alter the eating behavior of the primates in this colony.

Reliability

Table 1 presents reliability estimates for each pooled behavioral category used in this study. Each estimate is a pearson product moment correlation coefficient based on one-hundred and twenty 15-second modified frequency intervals which were taken during seven reliability observation days. Reliability observation days were

chosen by observer convenience with the condition that half of the observations were taken during reunion periods. This condition insured that social behavior patterns, not seen during separation, would appear in the reliability analysis.

Summary of Separation Effects

Tables III and IV present increases and decreases in individual and social behavior patterns which occurred as a function of separation conditions during the study. The first days of clear barrier separation produced increases in stereotypic behavior and the first days of opaque separation produced increases in locomotion, stereotypic behavior and passive behavior which indicated that the subjects were most severely affected by the opaque separation condition. The decrease in self grooming behavior, over days, during opaque separation periods suggested that some of the immediate reaction to separation continued in that condition while it did not in others. Table II indicates that self-directed sexual behavior decreased on the part of males following opaque separation and tactile/oral exploration of the environment and locomotion were slower to "recover" following opaque separations. Again, suggesting that the subjects were more affected by opaque barrier separation than other conditions.

Wire-mesh separation produced higher levels of inter-subject aggression which increased over replications especially on the first day of separation. Much of this increased aggression occurred in a subordinate

subject who resumed her more passive role during the reunion conditions. Agonistic behavior occurred most often following opaque separations, suggesting that higher levels of aggression observed during wire-mesh separations did not continue after the removal of the barriers.

C H A P T E R IV

DISCUSSION

Each of the separation conditions employed in this study produced a different set of behavioral changes and the differences among separation conditions are summarized in Table 2. However, none of the behavioral changes observed during longer-term separation appeared to meet the criteria for depression adopted from studies of this phenomenon in human and monkey subjects (see Chapter I). Further, the intense social behavior observed during reunion periods following all forms of separation and the absence of major behavioral changes from the pre-test to the post-test periods indicated that the few behavioral deficits produced by separation were essentially limited to the periods of incarceration. Comparisons between the experimental and the non-separated control groups further support this generalization.

While negative results are never conclusive, the failure to find depression under severe separation conditions may lead to suggestions of the conditions which must be met in order to develop a working model of separation-induced depression in older monkeys. Two conditions which may be important in the etiology of separation-induced depression are the predispositions subjects have to developing depression, based on their previous histories, and the extent to which the subjects view separation as an act of rejection by conspecifics.

The importance of early experience in determining older subjects'

responses to separation has been determined. Young, Suomi, and Harlow (1973) compared the responses of two groups of two-year old rhesus monkeys to wire-mesh separation and found that subjects who had experienced severe environmental deprivation, in the form of vertical chamber confinement during the first year of life, developed increases in self-clasping, huddling, and rocking during separation while control subjects (who had not experienced chamber confinement) developed increases in locomotion and stereotypic behavior. McKinney, Kiese, Suomi, & Moran (1973) compared the effects of vertical chamber confinement in two and four year old subjects, half of whom had experienced vertical chamber confinement one and one-half years priorto re-chambering. They found that although the previously chambered subjects were more behaviorally disturbed than the non-chambered subjects prior to re-chambering, re-chambering produced similar, but devastating, behavioral outcomes in all subjects regardless of their ages or their previous histories with chamber confinement. Together, these studies indicate that extremely severe environmental deprivation, i.e., vertical chamber confinement, produces behavioral disturbances in both healthy and previously chambered subjects while wire-mesh separation produces despair in older subjects who have experienced vertical chamber confinement but not in normal subjects. The subjects in the present study had experienced wire-mesh separation early in life and they did not develop depression when they were re-separated as adults. The initial separation produced protest behavior but not depression and, the absence of a history of depression may help to account for the

failure of the current study to produce depression. In addition, the contrast between the effects of vertical chamber confinement in older subjects who had not previously experienced confinement and the failure of the opaque barrier condition to produce depression in the current study supports the view that vertical chamber confinement is a manipulation which depends strongly upon factors above and beyond the social manipulation of eliminating visual contact between subjects.

In considering the second possible factor, rejection, it is important to recognize that while animal separation studies provide considerable control over the subjects' developmental histories and the physical separation conditions employed, the act of physically separating group members in an attempt to produce depression involves variables which are clearly beyond experimental control. Behavior observed during separation is probably affected strongly by the nature of the relationships of the subjects prior to separation and the subjects' perceptions of the effect separation has upon these relationships. Hinde and Spencer-Booth (1970; 1971) have suggested that in the case of mother-infant separation, disturbance observed during reunions which follow mother removal is most severe in relationships characterized by high levels of maternal infant rejection prior to separation. Results which they obtained from correlational studies suggest that the "tension" an infant may feel in the mother-infant relationship prior to separation, measured in terms of its relative role in maintaining maternal contact, is a more accurate predictor of the

distress observed during reunion than the actual time mothers and infants spend in contact prior to separation. Conflict over mother-infant contact in rhesus monkeys occurs during the first year of life when mothers begin to "reject" their infants' attempts to maintain ventral contact and, the distress produced by maternal rejection can often be seen in infant "tantrums" (Hinde & Spencer-Booth, 1967).

The time course of maternal rejection, which Hinde and Spencer-Booth report as highest at six months of age and at one year of age, is such that every rhesus monkey mother-infant separation study which has produced depression has taken place during a time when the infants were probably experiencing maternal rejection. The finding that bonnet macaques (see Species Differences, Chapter I) both lack the strong maternal rejection stage and fail to develop depression when separated from their mothers as infants also supports the potential importance of maternal rejection in anaclitic depression. Two counter-arguments can easily be raised to this point. First, bonnet macaque studies are confounded by the willingness of other group members to adopt infants who have had their mothers removed. However, unpublished data (Kaufman, Rosenblum, and Stynes, mentioned in Kaufman, 1973) suggest that even bonnet infants who are housed alone during separation may be resistant to separation induced depression. Clearly future studies are needed in this area. Second, studies of infant-infant separation in rhesus demonstrate that the role of a rejecting mother is not

essential in the development of depression in rhesus infants who have been reared only with peers. Infants reared in continuous contact without mothers (together-together infants) develop strong attachments such that infantile clinging behavior slows the development of normal play behavior (Harlow & Seay, 1964; Chamove, 1971). It is possible that the finding that separation produces depression in the absence of maternal rejection in these animals reflects more the abnormal rearing conditions they experienced than an unimportance of rejection. Further, the finding that infants reared with limited but long term peer contact and surrogates show only protest reactions to peer separation (Meyer, et al., 1975) suggests that the role of maternal rejection in infant depression may be considerable.

The meaning of separation to older monkeys remains almost a complete mystery. In the one study to date where separation produced depression in older subjects (Suomi, et al., 1975) the monkeys were housed within viewing distance of other, presumably non-depressed, conspecifics. Similar separations where the conspecifics which the subjects could biew were also separated (Blume-Babcock and Novak, in preparation) have failed to produce depression. What effect viewing conspecifics had on the development of depression in these subjects is unclear. However, it seems possible that futuee studies could vary both the social and the physical aspects of separation by using proximity to non-separated former group companions as an explicit part of the separation manipulation. An anecdotal observation that a japanese

monkey became "depressed" after he was defeated by former subordinates and rejected from the group (Kawai, cited in Napier & Napier, 1976) suggests that attempts to go beyond manipulating simple features of the physical environment employed during separation may yield a working model of depression if one is to be developed. In any case, the similarities between the current results and previous unsuccessful attempts to produce depression in older subjects indicate, once again, that depression is easier to produce in infants than in adults.

Two factors which may account for the protest response observed during initial separation in the current study are changes in the environment which accompanied separation and social separation, per se. Far from being completely unaffected by the separation conditions, the subjects' responses to initial incarceration indicated that they were distressed by separation and that the degree of distress depended strongly on the conditions of incarceration. Comparing the results of the first day of opaque barrier separation with previous studies, the gigh levels of locomotion, visual exploration, and active stereotypic behavior were consistent with protest patterns reported in single and repeated opaque separations of three year old rhesus monkeys (Bowden and McKinney, 1972; McKinney, Suomi, and Harlow, 1973). Also, these increases in activity were similar to protest behavior observed on the first day of separation in infants (Harlow and Suomi, 1974).

The initial responses to clear barrier separation and wire-mesh separation included less general activity than was observed during opaque barrier separation. This difference supports previous suggestions that increases in motor activity and exploration during early separation may reflect a reaction to the amount of change in the physical environment associated with separation (Bowden and McKinney, 1973). During the first separation the subjects experienced during this study (the first replication of wire-mesh separation) the subjects exhibited much higher levels of tactile/oral exploration and passive stereotypic behavior than they exhibited in subsequent replications of wire-mesh separation. Further, by the final replication of each condition, clear barrier separation produced the highest levels of these behavior patterns while wire-mesh separation produced the lowest (see figures 3 and 4, above).

The importance of social separation, independent of changes in the environment, in producing this protest pattern to early incarceration can be inferred from a study of the threat of separation. Willott and Daniels (1974) demonstrated that the presence of a transport cage, which signaled an impending separation to three year old rhesus monkeys, produced increases in stereotypic behavior, locomotion, and distress behavior. In addition, individual responses to the threat varied, depending on the behavior of the the partners in each pair, suggesting that social facilitation was an important factor in determining the amount of distress observed in individual subjects. In short, it

seems that adult protest reactions to initial incarceration are determined by a complex interaction of variables including both changes in the environment and social separation.

While expectations that this research might yield a model of depression were not confirmed by the data, the finding that substantial increases in agonistic behavior occurred on the first day of wire-mesh separation provided an important demonstration of the complexity of factors involved in adult separations. Erwin, Mobaldi, and Mitchell (1971) noted that juvenile monkeys who were separated by translucent barriers threatened the images of each other during two-day separations and that during reunion they maintained high inter-individual distances. However, Erwin, et al. were unable to determine the extent to which these threats involved recognition of the objects to which they were directed. In the present study, threats and physical aggression were clearly directed towards conspecifics.

Agonistic behavior appeared to decrease from first day levels during longer term wire-mesh separation. The lack of agonistic behavior during the reunion periods following wire-mesh separations may have been due to changes in the timing of grooming peaks observed over replications of wire-mesh separation. That is, replications of wire-mesh separation produced both increases in agonistic behavior on the first day of separation and increases in grooming behavior on the last few days of wire-mesh separation. One possible explanation of the increases in agonistic behavior may be that replications of

separation provided the opportunity for some subjects to learn that under the wire-mesh condition they could successfully engage in aggressive behavior against subjects who had previously dominated them by either singlehandedly defeating them in againistic encounters or by evoking the co-operation of other subjects in the group. Under wire-mesh separation physical size did not appear to confer any observable advantage in agonistic encounters and co-operative aggression against single subjects could not occur. The subject who engaged in the highest levels of aggression appeared to be the most subordinate female within the group, Nelly. However, a second subject, also a female, engaged in more aggressive behavior during wire-mesh separation than during the reunion periods and her dominance rank was second in the group of four. Most of the aggression observed occurred between Nelly and Scarlet, the other female. It seems reasonable to speculate that, based on a long standing rivalry between Scarlet and Nelly prior to the separation series, an increase in aggressive behavior on the part of Nelly alone might account for some increase in aggression on the part of Scarlet. However, the finding that males did not show increases in agonistic behavior during wire mesh separation is difficult to fit, using this explanation, with informal observations that the third ranking subject in the hierarchy was a male.

An alternative explanation of the increases in agonistic behavior observed during wire-mesh separation may be that the subjects were partially deprived of reinforcement for attempted social behavior (i.e., reciprocal social behavior) during wire-mesh separation

and that this change in the contingencies on their behavior was somehow related to the increases in agonistic behavior observed in females.

A suggestion for how this could occur is provided by a study of rhesus monkeys who were partially deprived of reinforcement for behavior in an ongoing operant task. Melges and Poppen (1976) reported that "emotional" behavior consisting of violent cage shaking, manipulandum pounding, vocalizations, finger chewing, and apparatus distruction could be provoked in monkeys by lengthening the intertrial interval in an ongoing task where the subjects were required to wait for long periods between responding in order to obtain reinforcement. In such a schedule (termed differential reinforcement of low rates), premature responses reset the clock determining how long the subject must wait before responding and substantial increases in the intertrial interval result in a partial extinction paradigm. It appears, although Melges and Poppen's data are somewhat cloudy on this point, that extinction produced less emotional behavior than increases in the intertrial intervals.

If one allows a tentative leap from individual responses produced by changes in the clearly defined reinforcement schedules in an ongoing operant task to social behavior produced by changes in contingencies of behavior which cannot be defined as precisely, then some interesting speculation can follow. In the present study, wire-mesh separation could be interpreted as a frustration producing condition because the subjects could maintain some forms of physical contact (which

presumably are rewarding to monkeys) such as limited grooming but they could not engage in normal levels of these behavior patterns. During clear and opaque barrier separation, physical contact was much more limited and these conditions may correspond to an "extinction" schedule of reinforcement for social behavior. Using this interpretation of the separation conditions, the higher levels of agonistic behavior seen during wire-mesh separation may reflect higher levels of frustration produced by the partial loss of reinforcement while the low levels of agonistic behavior produced by clear barrier separation may relfect a less frustrating, more complete, loss of reinforcement.

The finding, in the current study that females engaged in more agonistic behavior than males can then easily be explained by observations of nonseparated rhesus monkeys which indicate that females normally engage in higher levels of grooming than males (cf. Kaufman, 1967). Presumably grooming and being groomed are more rewarding activities for females than for males and hence, reductions in the opportunities to groom and be groomed would more severely effect female subjects.

Another consideration which must be raised is the differing opportunities for the expression of frustration produced by each condition. Agonistic behavior may have occurred most frequently during wire mesh separation simply because the subjects were unable to make physical agonistic contacts during the other conditions. While components of agonistic behavior could occur in all conditions (vocalizations in opaque barrier separation and vocalizations combined with threat postures in clear barrier separation) wire-mesh

separation clearly provided greater opportunities for agonistic contact. The finding that stereotypic behavior occurred more frequently during initial clear and opaque barrier separation and that locomotion occurred most frequently during initial opaque barrier separation suggests that the subjects' initial responses to incarceration may have varied both as a function of the degree of deprivation and as a function of the opportunities for contact allowed by each condition.

The finding that females engaged in agonistic behavior during wire-mesh separation cannot be satisfactorily explained by only one of these hypotheses. In the present study, all of these factors probably contributed to behavior observed during initial incarceration and it remains for future studies to explore the possible relationships among them.

In sum, the factors which may eventually yield a working model of separation-induced depression in older primate subjects will no doubt include, but not be limited to, simple features of the separation housing environment and crucial differences between separation in infants and separation in adults remain to be understood.

Table 1

	Pre-Test Period					
	1 - 9					
Replication 1	Wire	Reunion	Clear	Reunion	Opaque	Reunion
Days	1 - 9	1 - 3	1 - 9	1 - 3	1 - 9	1 - 3
Replication 2	Clear	Reunion	Opaque	Reunion	Wire	Reunion
Days	1 - 9	1 - 3	1 - 9	1 - 3	1 - 9	1 - 3
Replication 3	Opaque	Reunion	Wire	Reunion	Clear	Reunion
	1 - 9	1 - 3	1 - 9	1 - 3	1 - 9	1 - 3

	Post-Test Period	
	1 - 9	10 - 18

TABLE 2

BEHAVIORAL CATEGORY	CORRELATION COEFFICIENT
Stereotypies (active and passive)	$r = .9789$ $r^2 = .9582$
Agonistic Behavior	$r = .9834$ $r^2 = .9671$
Dominance Displays	$r = .9990$ $r^2 = .9981$
Locomotion	$r = .9588$ $r^2 = .9193$
Tactile/oral Exploration	$r = .9581$ $r^2 = .9180$
Visual Exploration	$r = .9735$ $r^2 = .9477$
Social Contact	$r = .9043$ $r^2 = .8178$
Social Play	$r = .9668$ $r^2 = .9347$
Self Play	$r = .9394$ $r^2 = .8825$
Social Groom and Present	$r = .9970$ $r^2 = .9940$
Self Groom and Scratch	$r = .9133$ $r^2 = .8341$
Belly Present	$r = 1.0$ $r^2 = 1.0$ (not observed)
Sex Mount and Present	$r = .9908$ $r^2 = .9817$
Self Sex	$r = 1.0$ $r^2 = 1.0$ (not observed)
Vocalizations	$r = .9954$ $r^2 = .9908$

TABLE 3

Within Separation Comparisons

	Wire		Clear		Opaque	
	First day	Longer term	First day	Longer term	First day	Longer term
Increased	Agonistic(♀)	Social Groom* Agonistic (Days)	Active Stereo(♂) Passive Stereo(R) Tac/Oral (R)	Tac/oral*	Locomotion** Active Stereo(♂) Passive Stereo(R) Visual Explore**	
Decreased				Social Contact* Social Groom*		Self Groom (Days) Social Groom* Agonistic (Days) VOC (R)

* Condition main effect superceded by interaction in text.
**Condition main effect not superceded by interaction, see text.
( ) indicates addition term (s) included in interaction.
R indicates replications.

Table 4

Reunion comparisons

	After Wire Mesh	After Clear Barrier	After Opaque Barrier
Increased			Agonistic (♀)
Decreased		Agonistic (♀)	Self Sex (♂) Tac/Orai (first day) Locomotion (second day)

Figure 1

Active Stereotypic Behavior: First Day

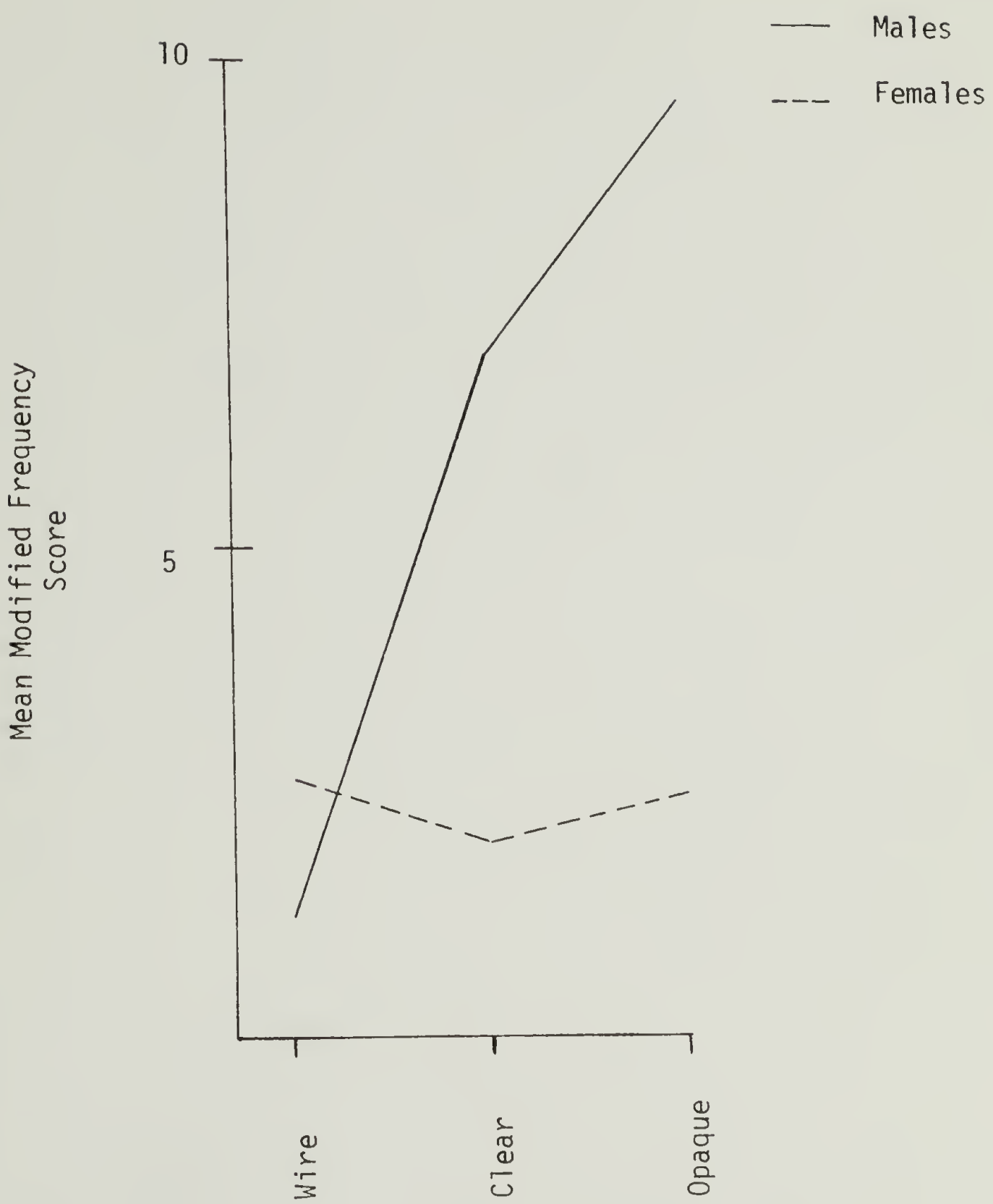


Figure 2

Agonistic Behavior: First Day

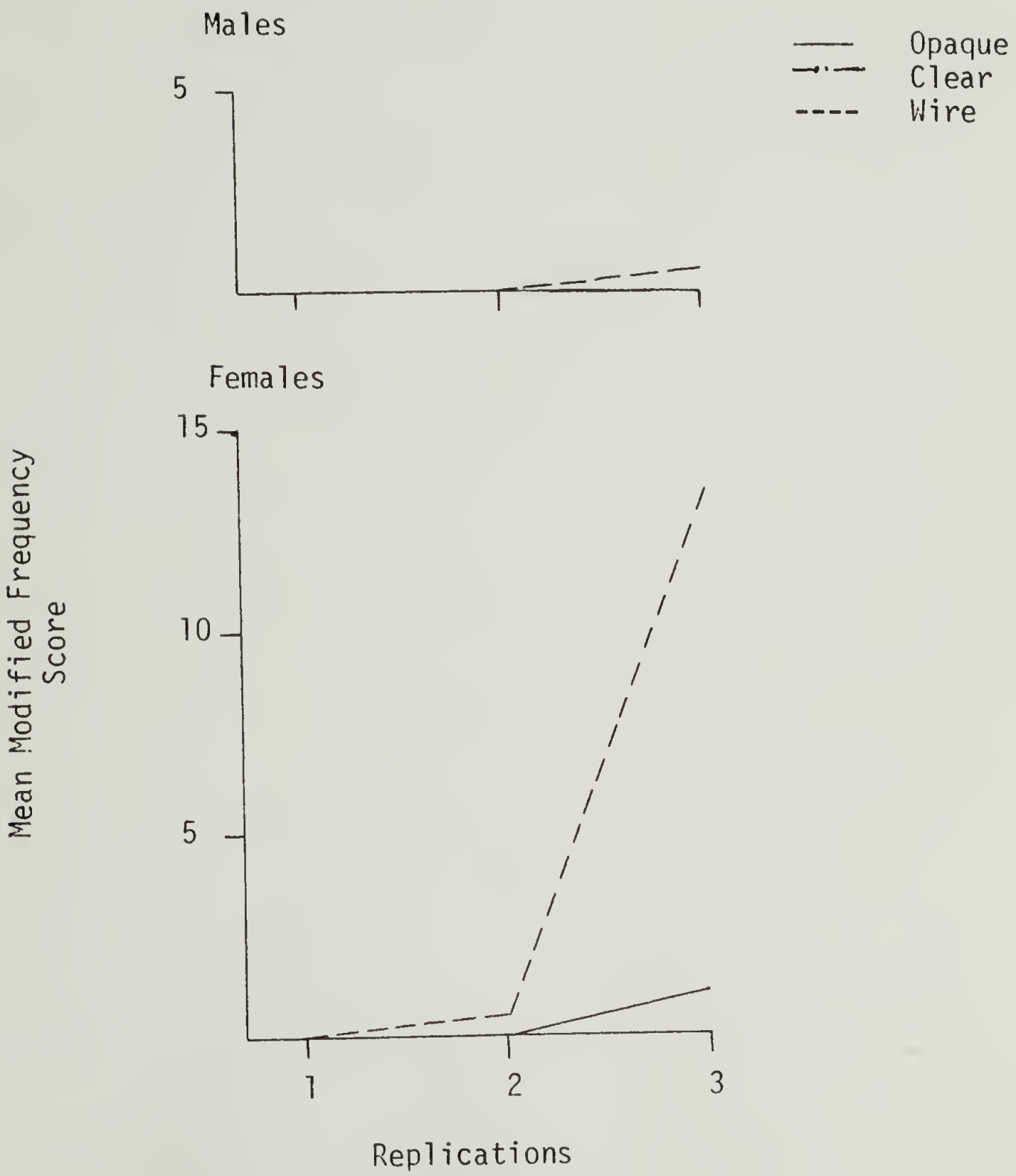


Figure 3

Tactile/Oral Exploration: First Day

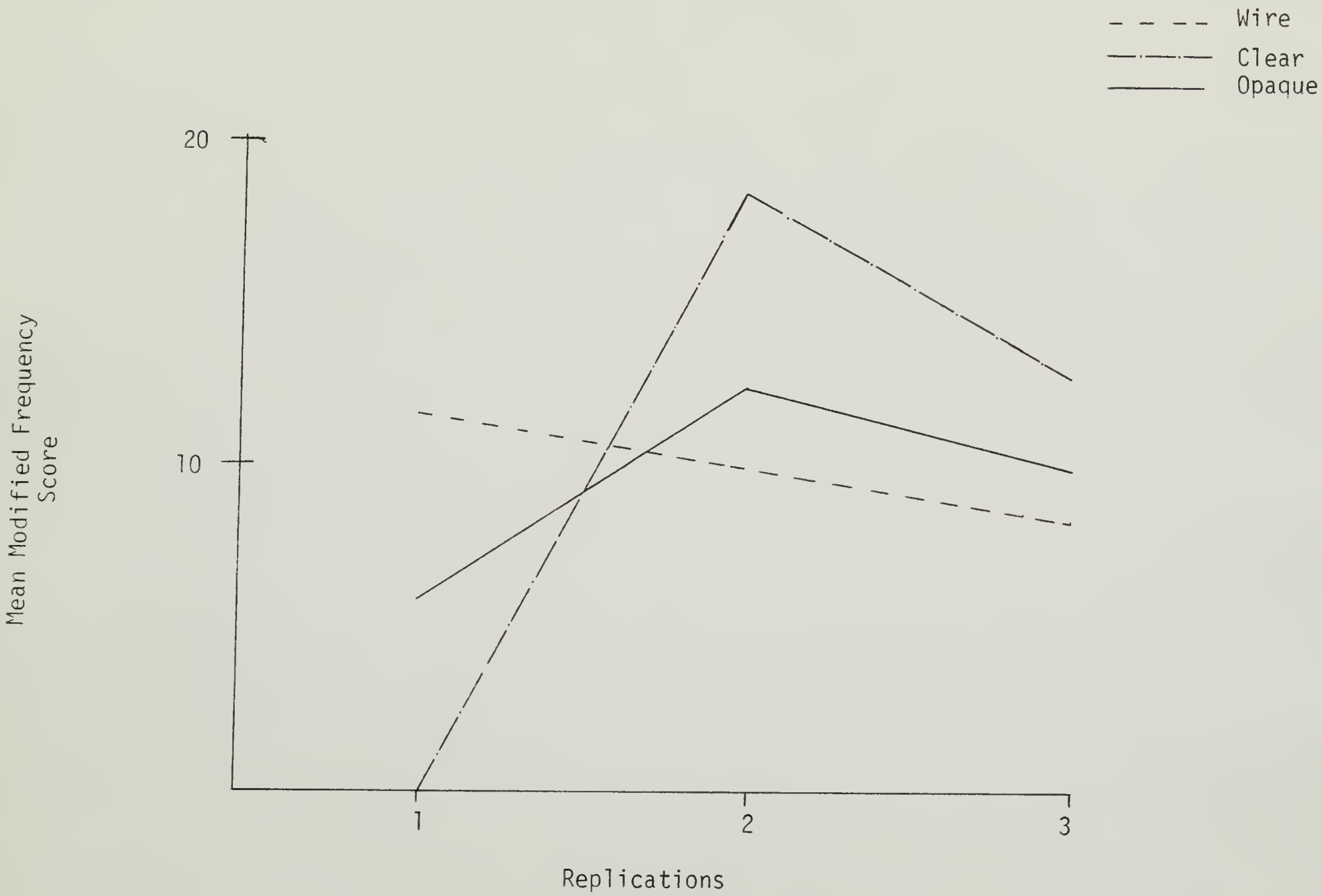


Figure 4

Passive Stereotypic Behavior: First Day

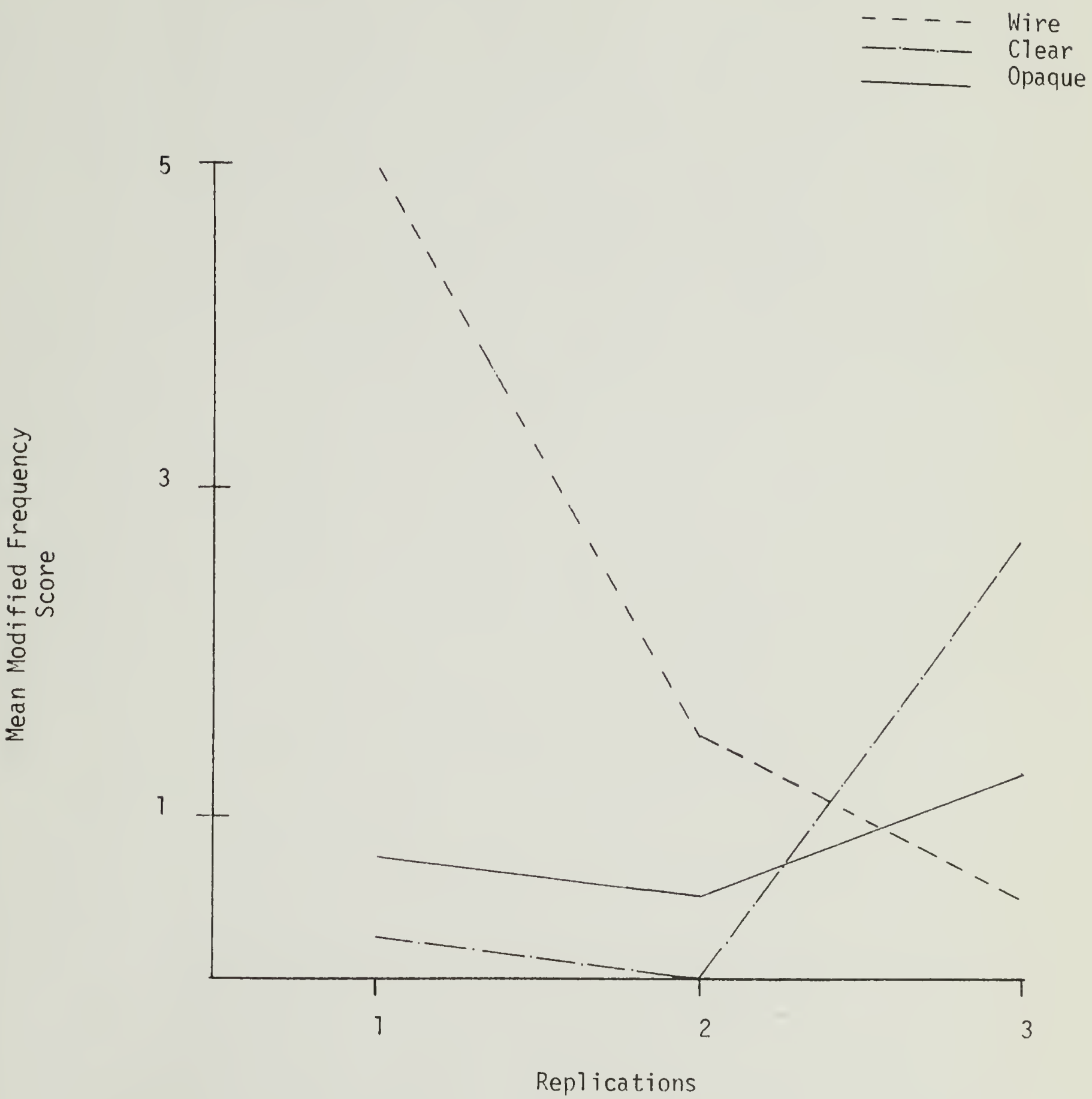


Figure 5

Self Groom: Longer-term Separation

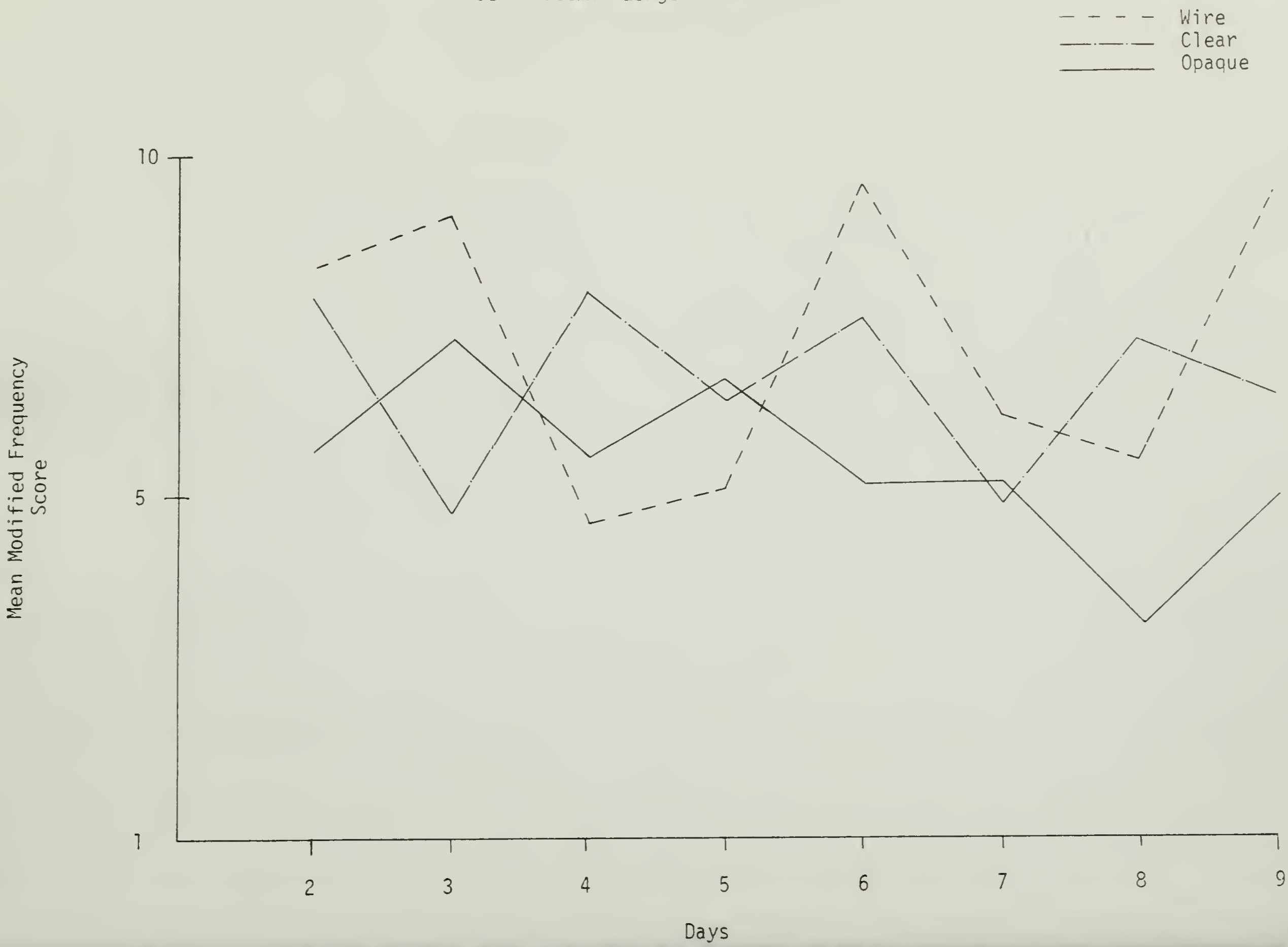


Figure 6

Vocalizations: Longer-term Separation

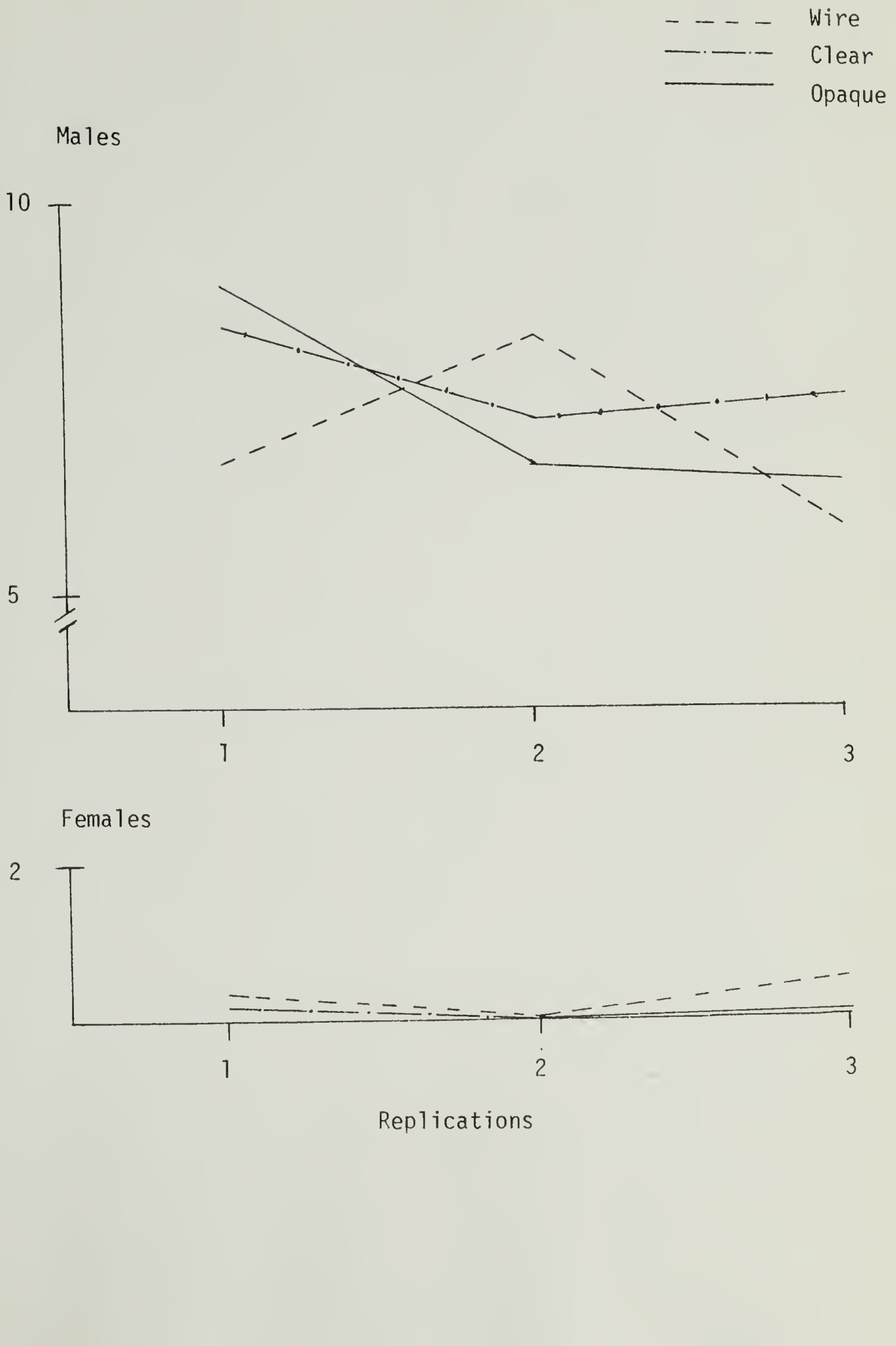


Figure 7

Agonistic Behavior: Longer-term Separation

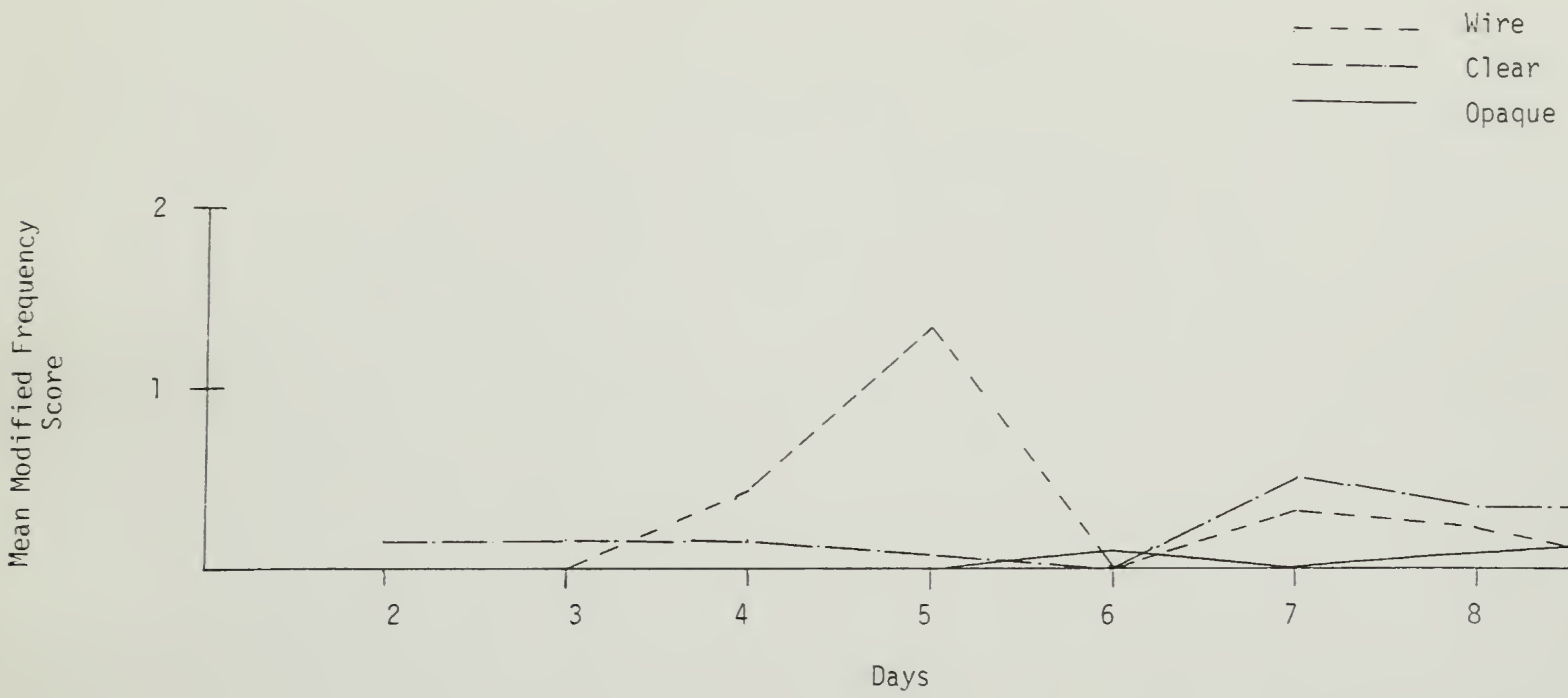


Figure 8

Social Contact: Longer-term Separation

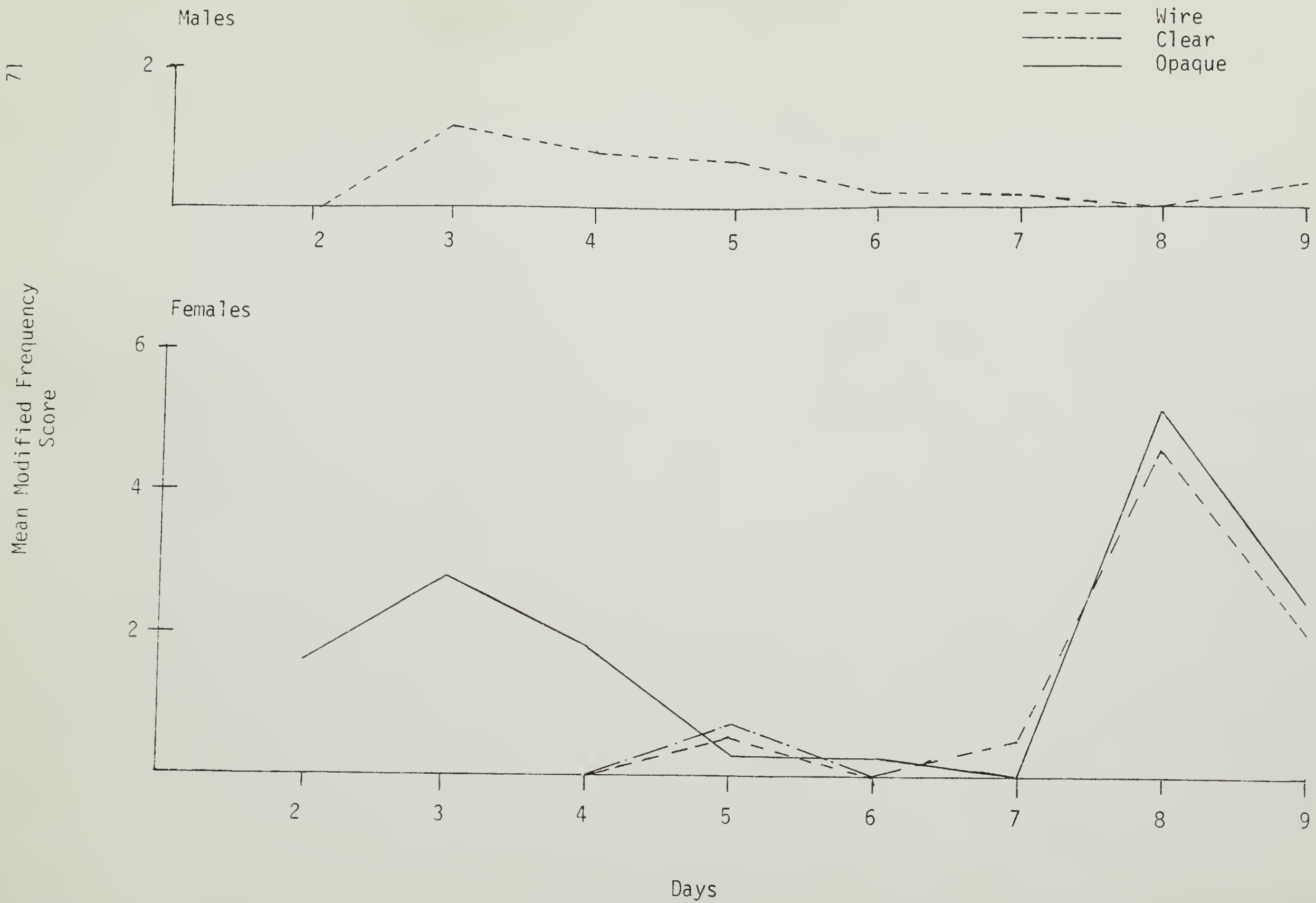


Figure 9

Social Groom and Groom Present: Longer-term Separation

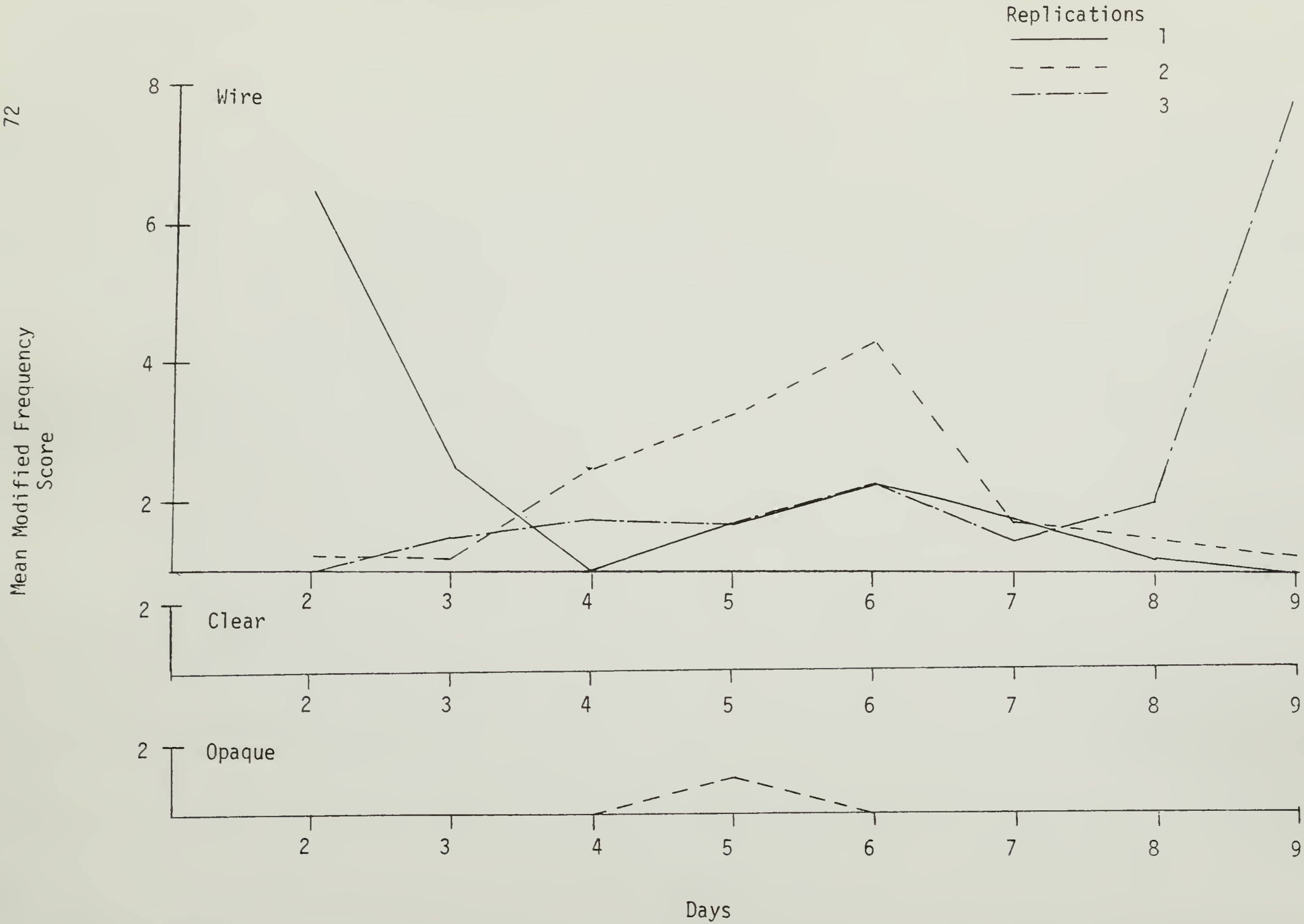


Figure 10

Locomotion: Longer-term Separation

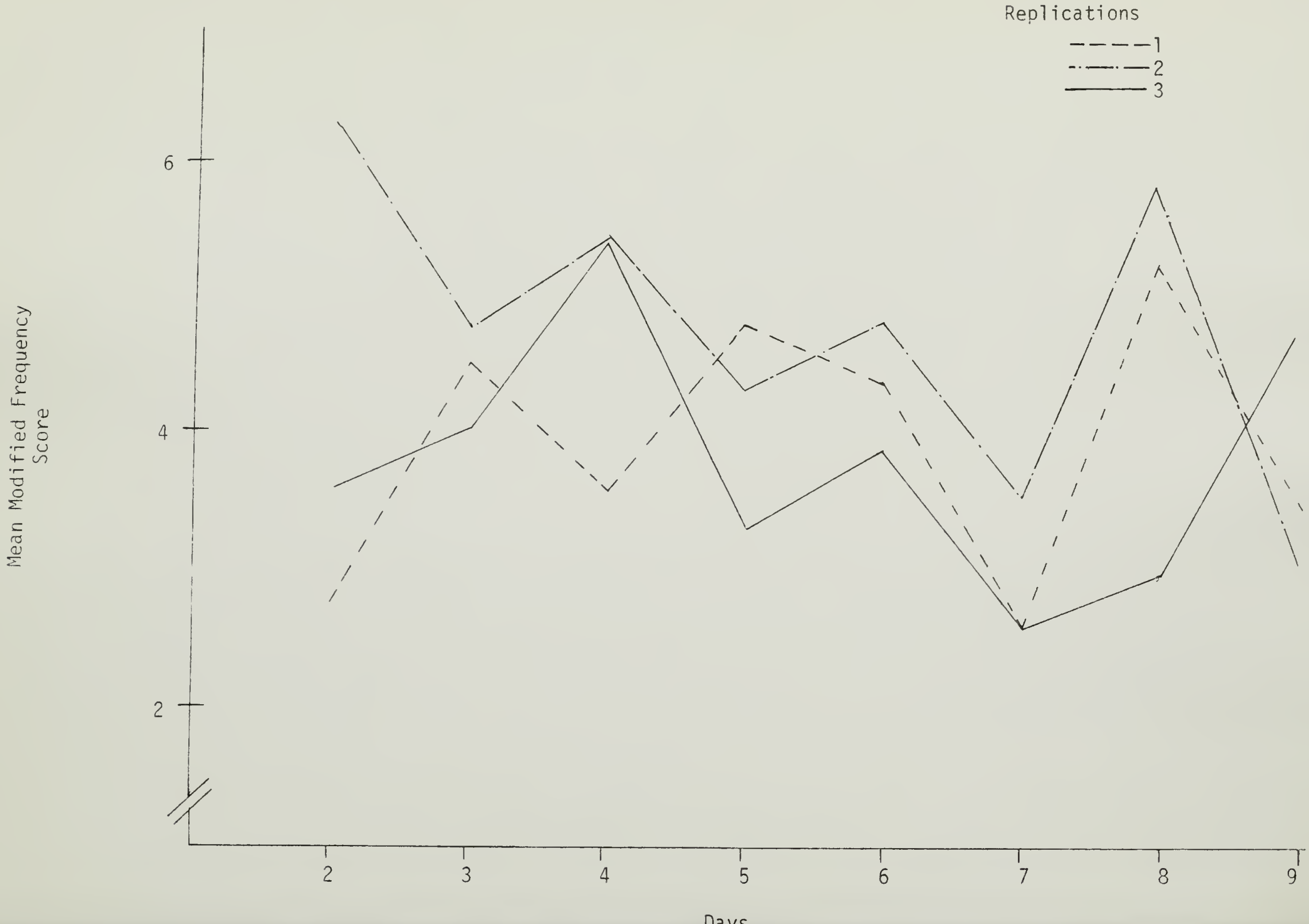


Figure 11

Reunion

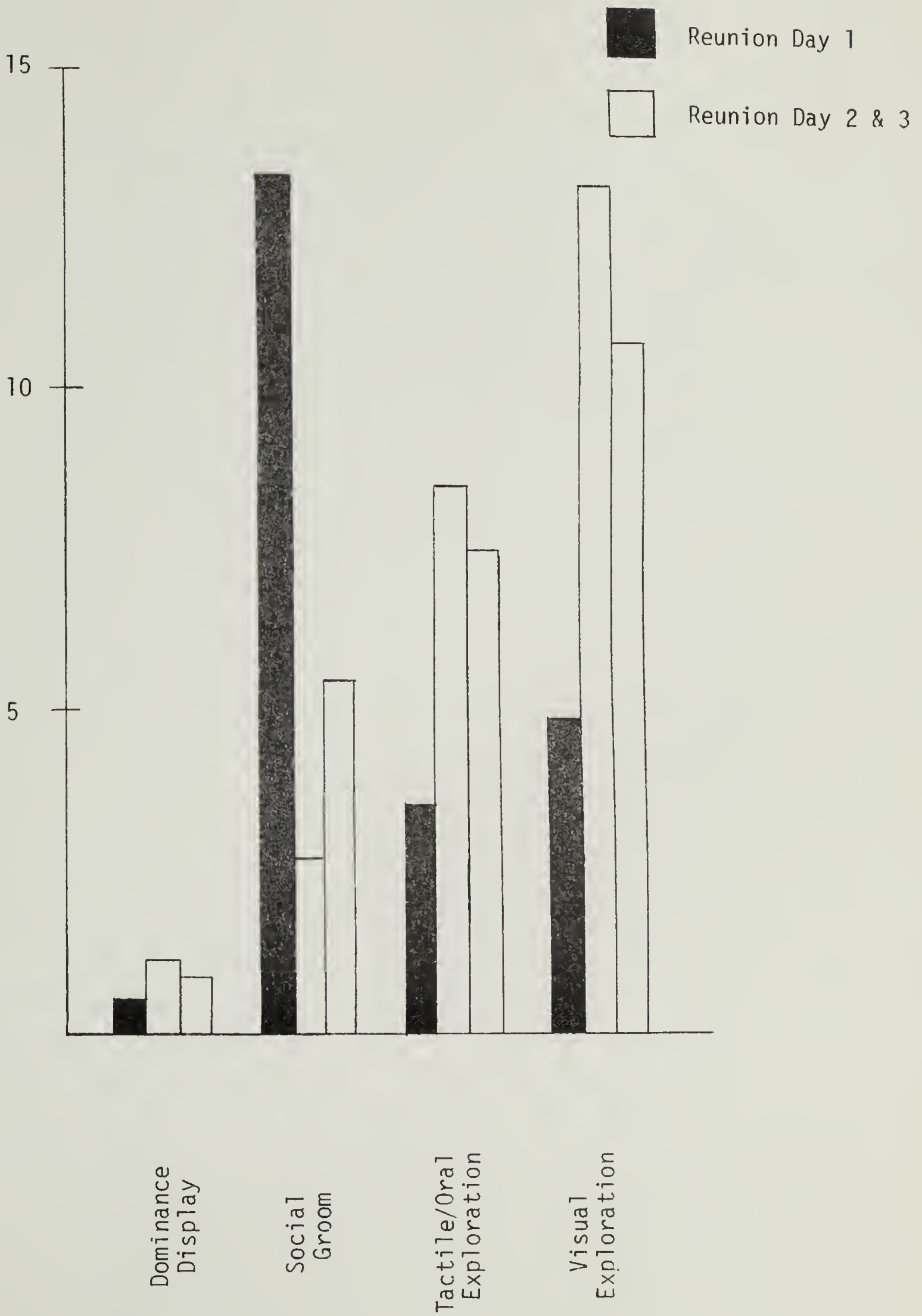


Figure 12

Dominance Display: Reunion

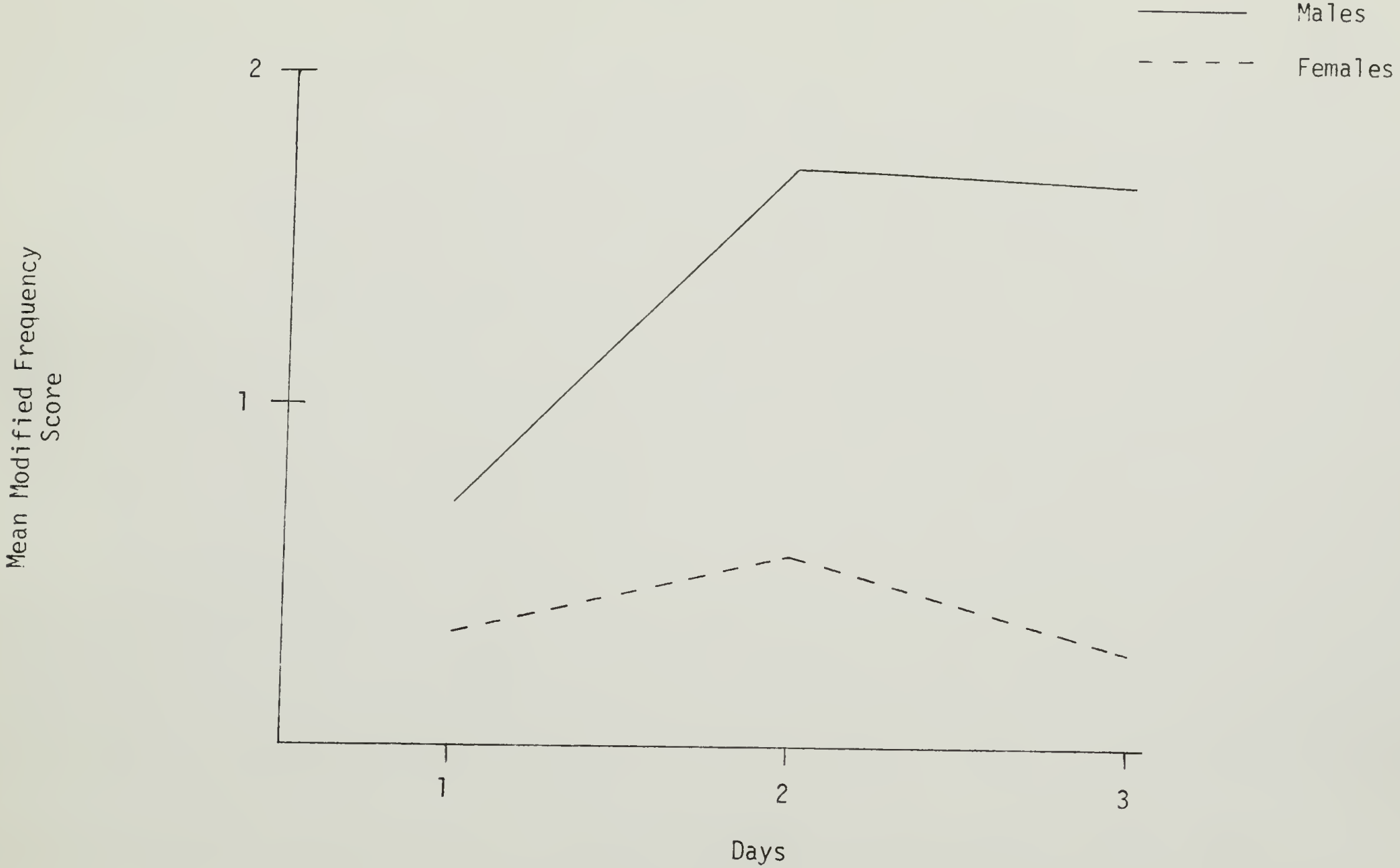


Figure 13

Tactile/Oral Exploration: Reunion

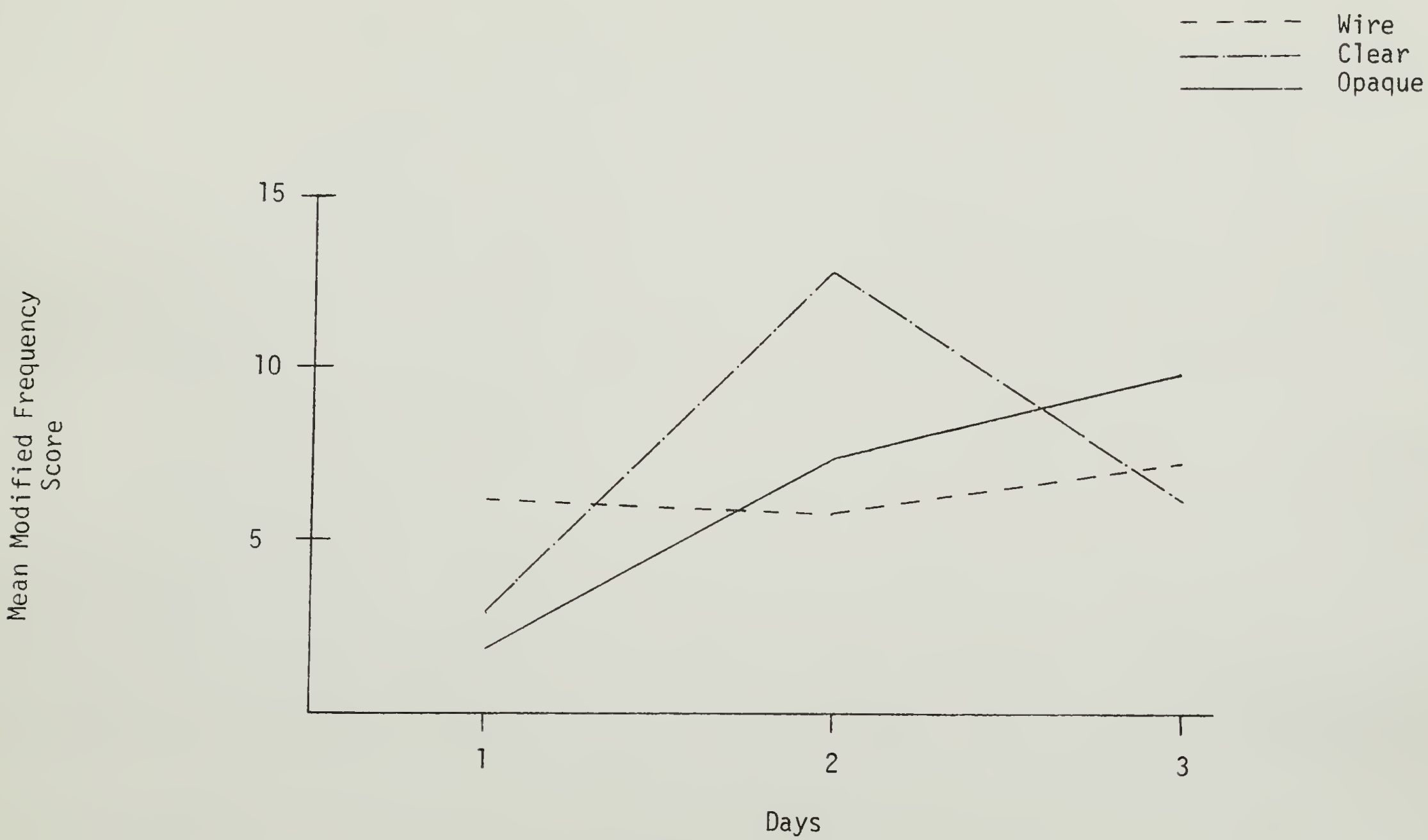


Figure 14

Locomotion: Reunion

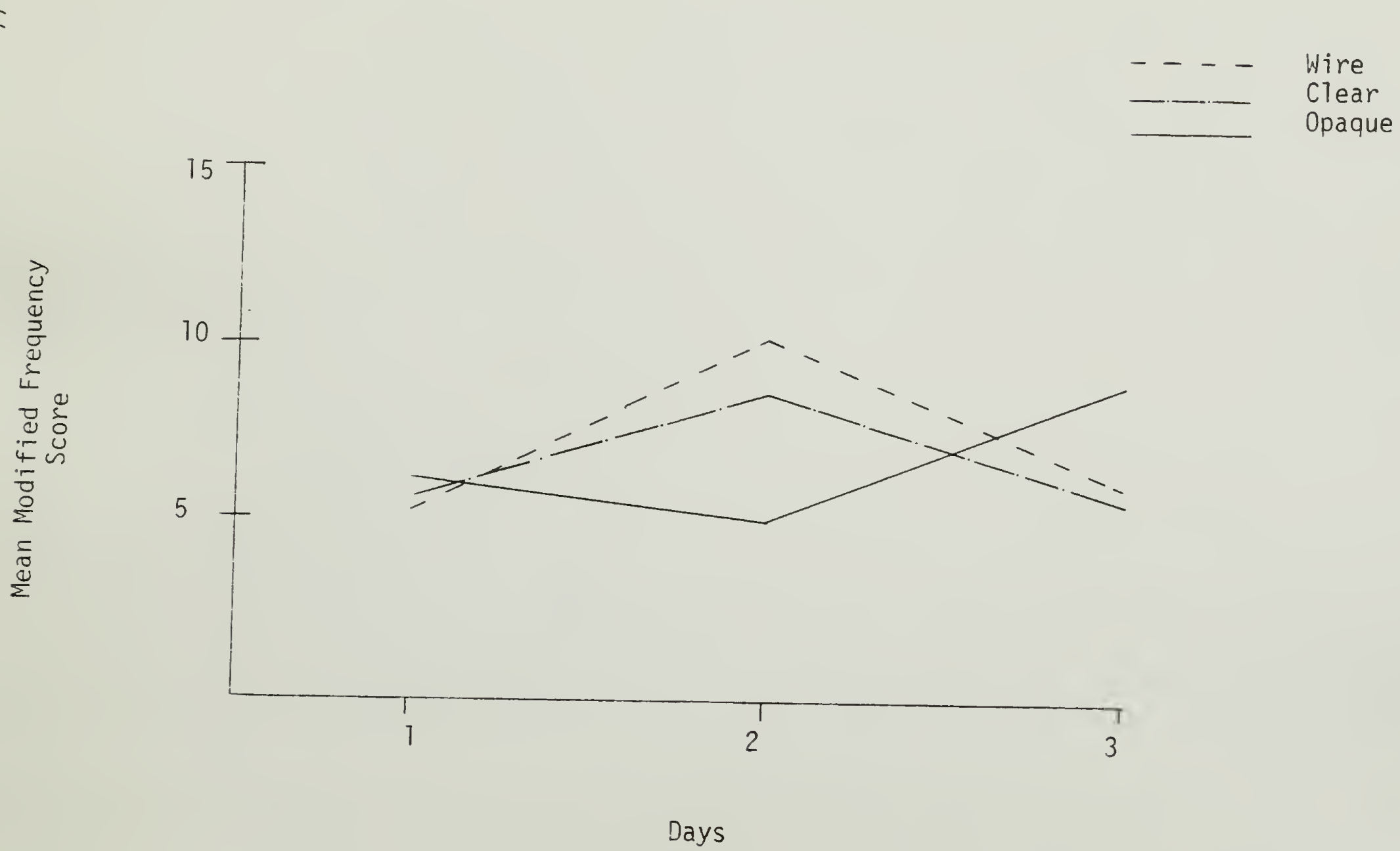


Figure 15

Self Sex: Reunion

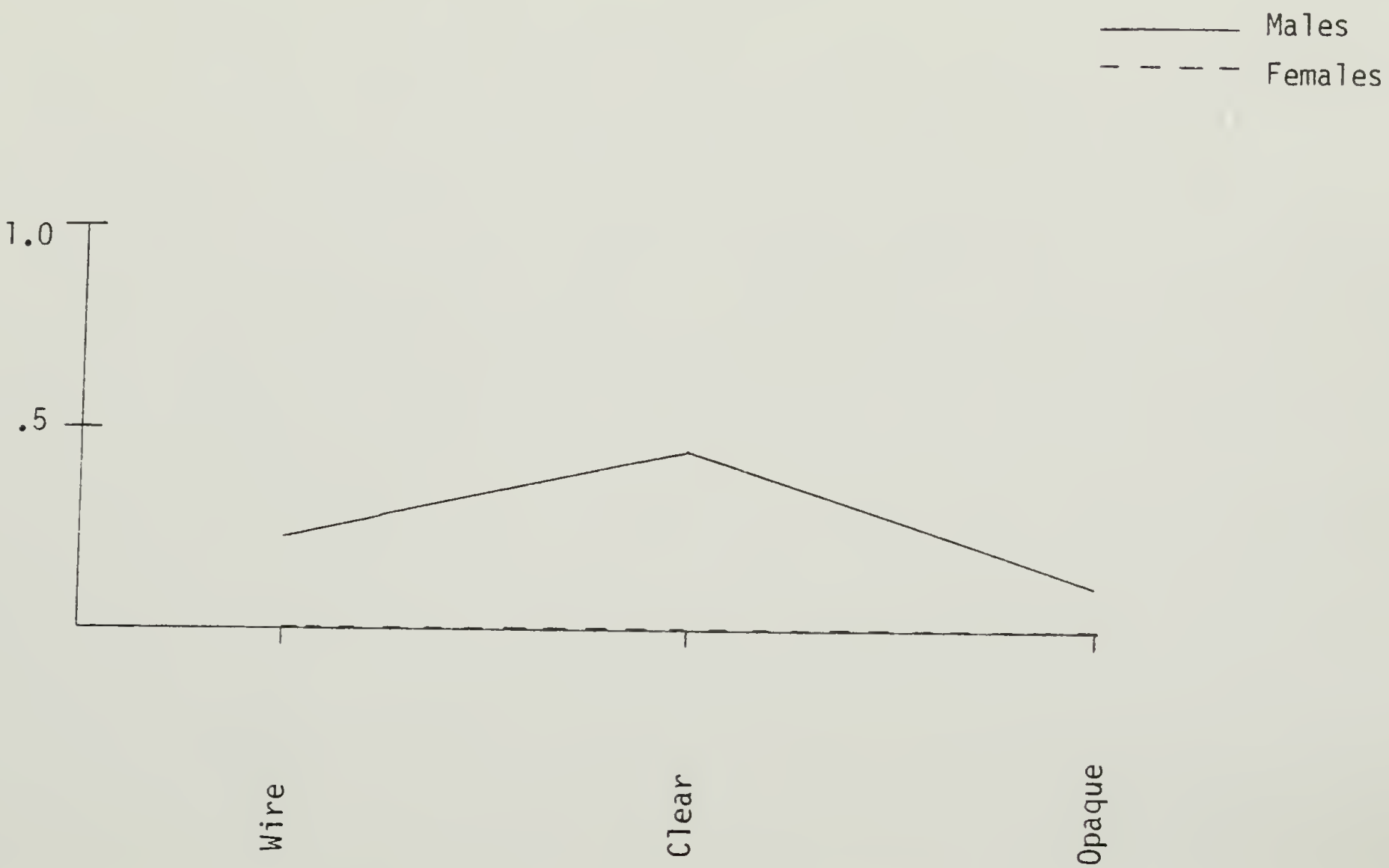


Figure 16

Agonistic Behavior: Reunion

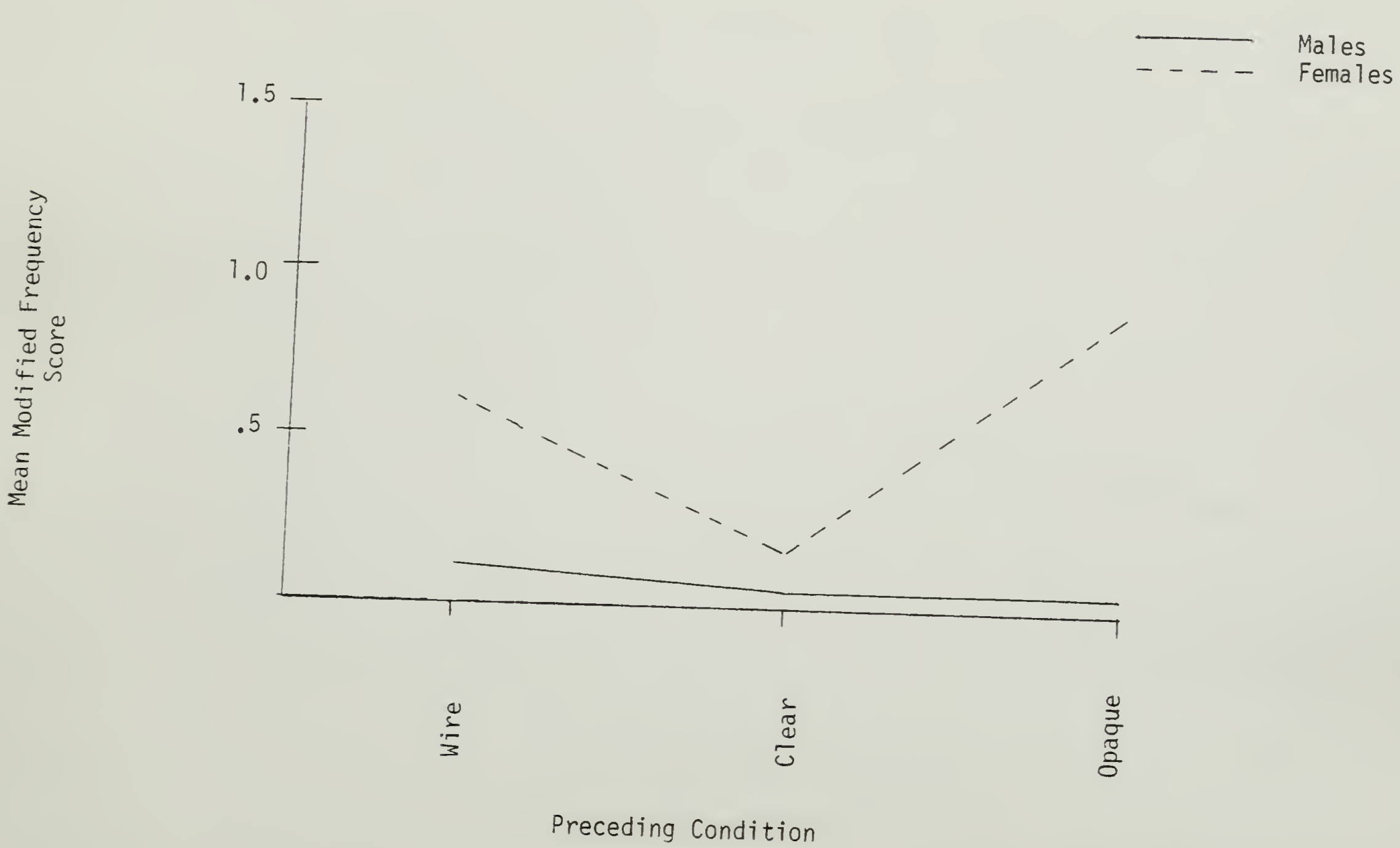


Figure 17

Social Play: Reunion

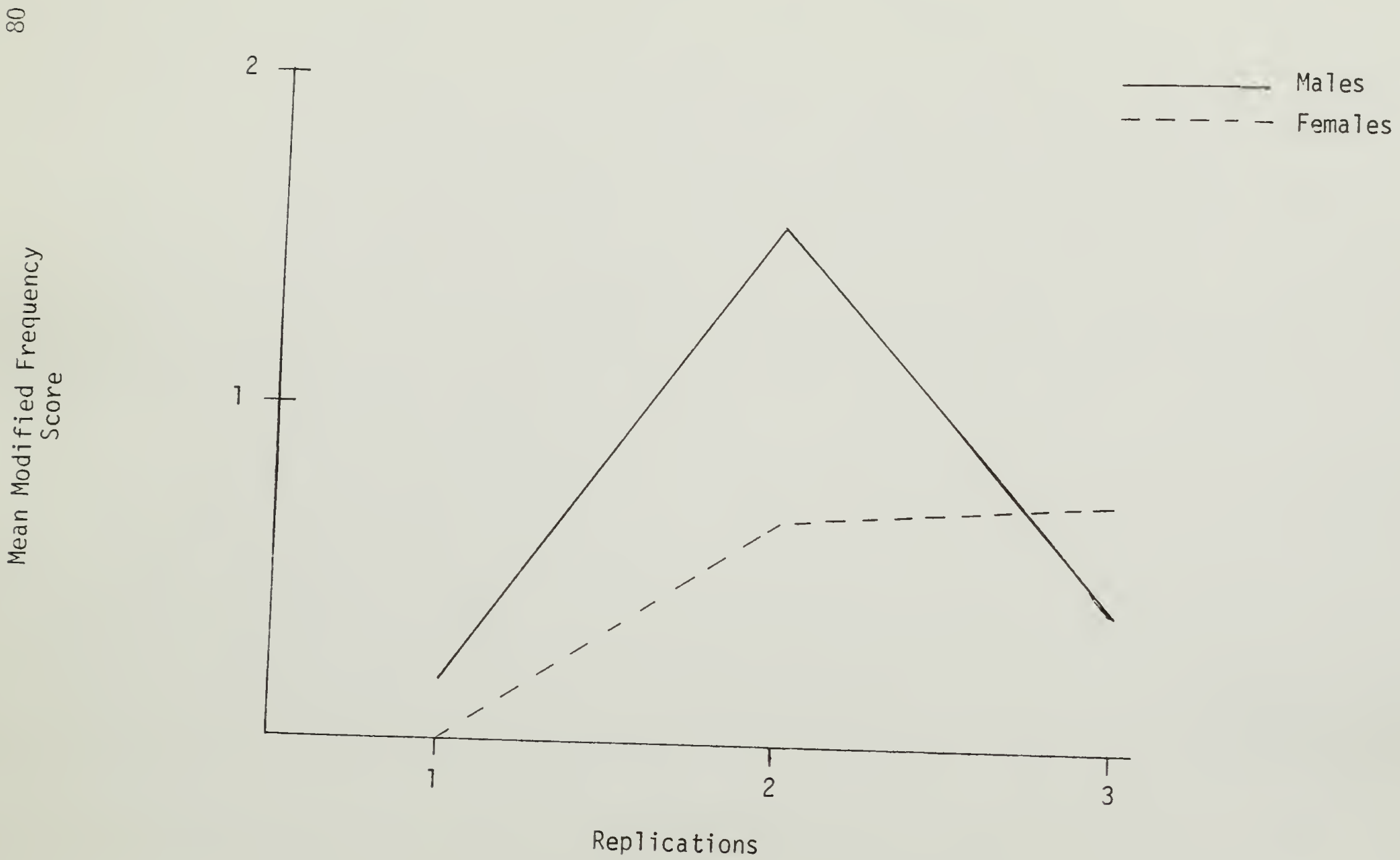


Figure 18

Belly Present: Reunion

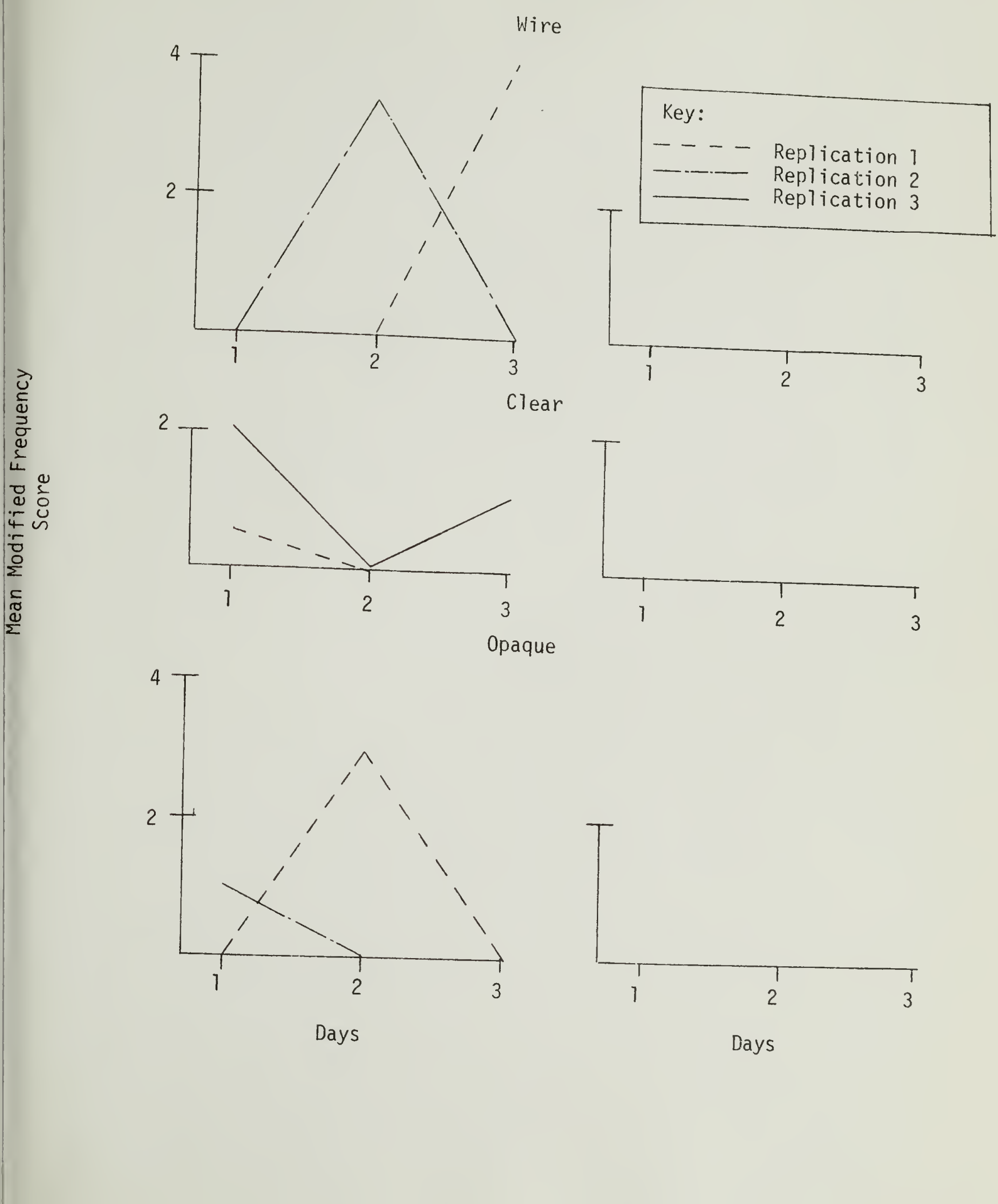


Figure 19

Agonistic Behavior

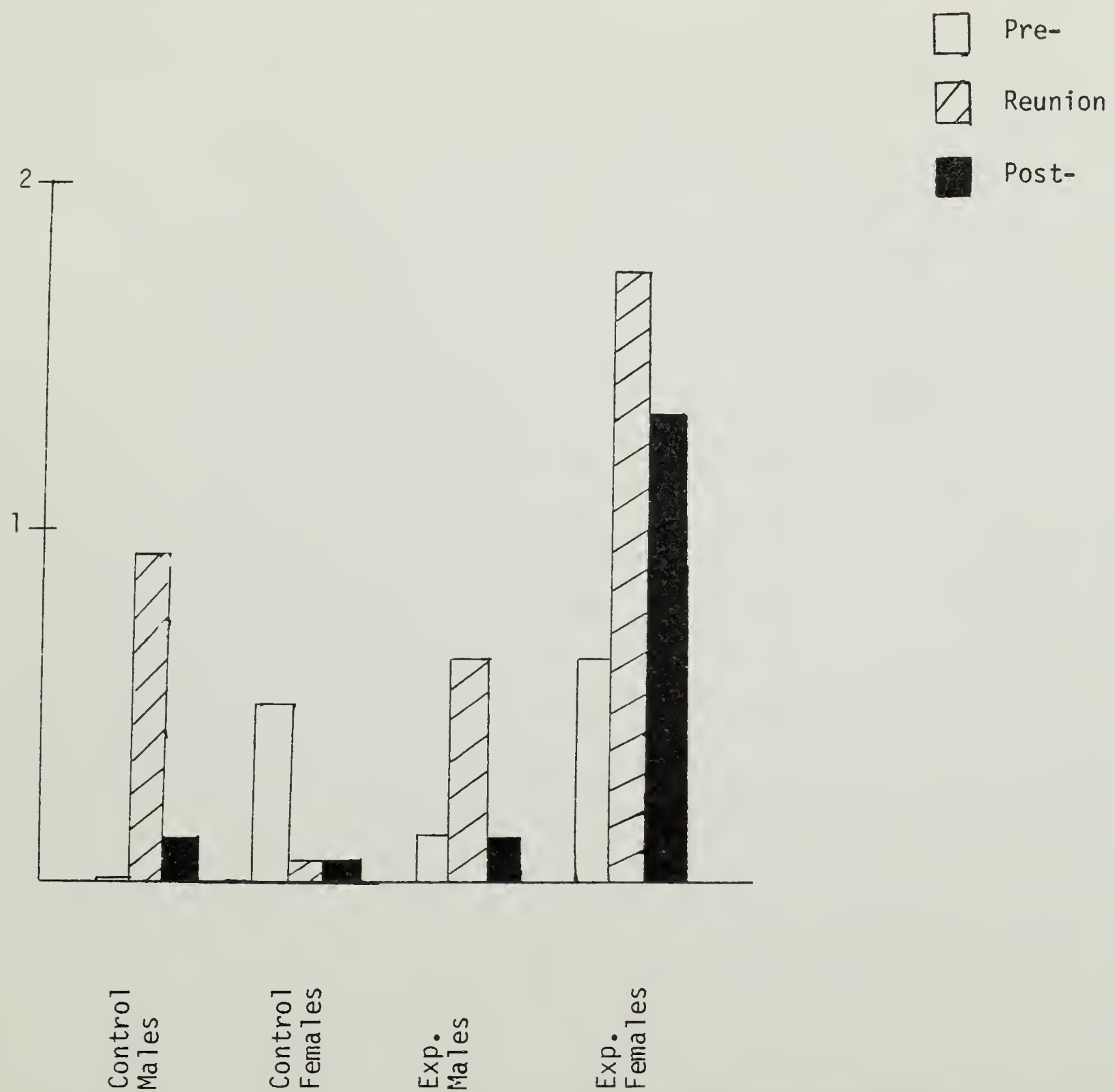
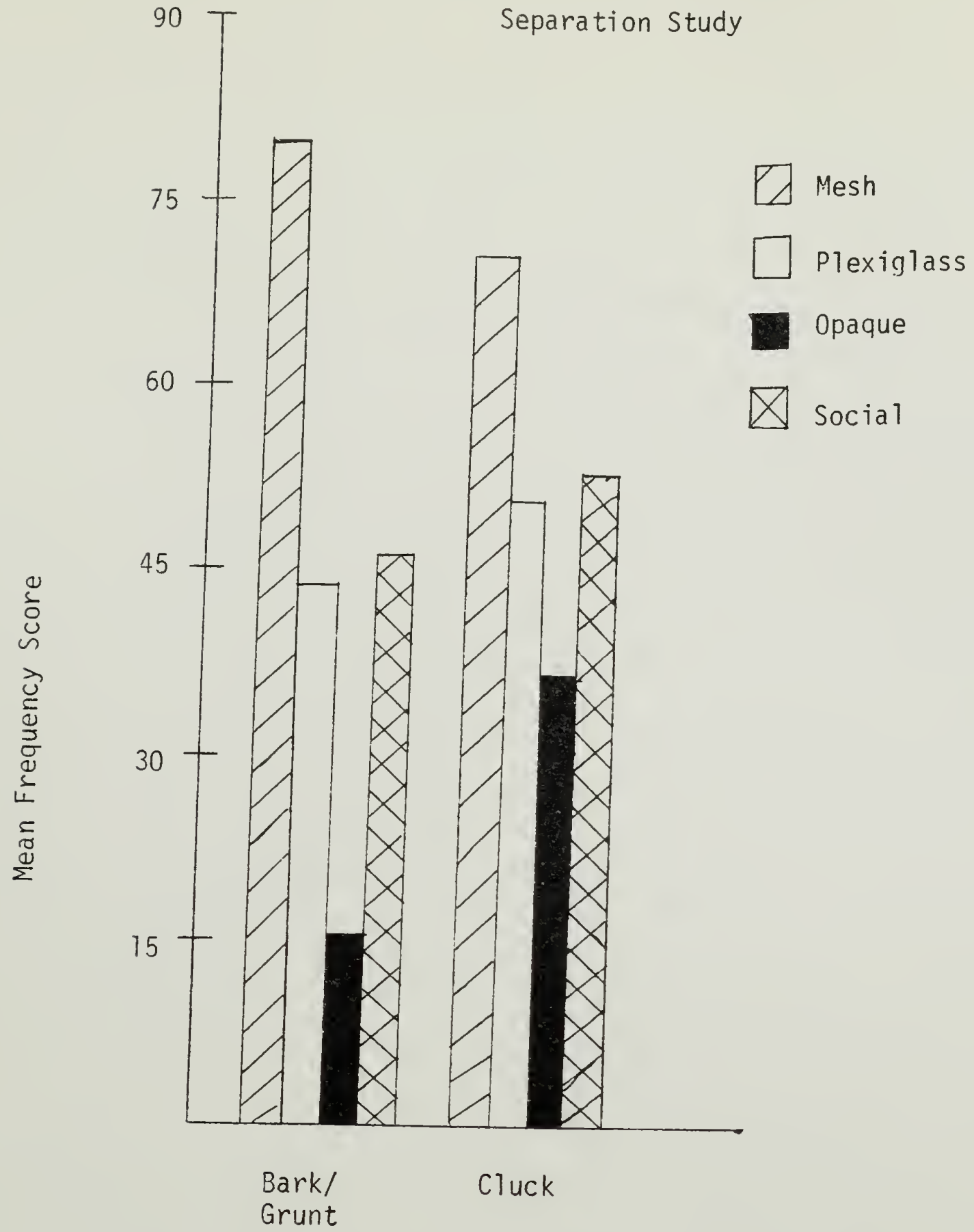


Figure 20

Separation Study



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Appendix A

Sample Vocalization Scoring Sheet

Condition_____ Day_____ Date_____

Time	Coo	Bark/Grunt	Cluck	Screech	Total
10:00 am					
1:00 pm					
2:30 pm					
4:00 pm					
5:30 pm					
7:00 pm					
8:30 pm					
10:00 pm					
11:30 pm					
1:00 am					
2:30 am					
4:00 am					
5:30 am					
7:00 am					
8:30 am					
Total					

Appendix B

Behavioral Categories: Pooled for Analyses

Pooled Behavioral Category	Component Behavioral Patterns
Passive Stereotypic Behavior	Self Clasp, Self Bite, Self Mouth, Huddle, Rock, Other Self Directed Behavior
Active Stereotypic Behavior	Stereotypic Patterns and Pacing
Agonistic Behavior	Fear Grimace, Threat, Aggress, Chase
Dominance Display	Barrier Attack, Dominance Display, Crook Tail, Locomotion, Yawn
Displacement	Displacement
Locomotion	Locomotion
Tactile/Oral Exploration	Tactile/Oral Exploration
Visual Exploration	Visual Exploration
Social Contact	Social Contact, Ventral-Ventral Cling Dorsal-Ventral Cling
Social Play	Social Play
Self Play	Self Play
Social Groom	Mutual Groom, Social Groom, Groom Present
Self Groom	Self Groom and Scratch
Belly Present	Belly Present
Social Sexual Behavior	Sex Present, Sex Mount
Self Sex	Self Sex
Vocalizations	Moan/Lipsmack, Screech, Other Vocalizations

Behavioral Definitions: Single Behavior Patterns

Self Clasp, firm manual or pedal clasping of body, exclusive of self sex.[2]

Self Bite, specific self directed bite.[2]

Self Mouth, oral contact with any part of the body excluding self bite and self sex.[2]

Huddle, self enclosed, fetal-like, position with head positioned below shoulders.[2]

Rock, repetitive forward and backward motion excluding locomotion.[2]

Pacing, stereotyped locomotion, scored following one repitition.

Stereotypic patterns, individual movement motor patterns which are repeated consistently (e.g., hang wringing) in a stereotyped fashion.

Other Self Directed Behavior, non-categorized self directed behavior patterns which are not stereotypic.

Fear Grimace, facial expression resembling smile with teeth exposed.[2]

Threat, facial expression with ears pulled back, and jaw lowered, often accompanied by barks or grunts.[2]

Aggress, behavior directed at another animal including vigorous biting hair pulling, and clasping accompanied by threat or piloerection.[2]

Chase, intense following or attempts to make contact during agonistic sequences, accompanied by threats, barking, or aggression.

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[2]McKinney, Suomi, & Harlow, 1972a used similar behavior definitions.

Behavioral Definitions: Single Behavior Patterns

Self Clasp, firm manual or pedal clasping of body, exclusive of self sex.[2]

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[2]McKinney, Suomi, & Harlow, 1972a used similar behavior definition.

Barrier Attack, single or repeated thrusts against cage walls or barriers.

Dominance Display, repeated stereotyped shaking of the cage.

Crook Tail Locomotion, stereotypic locomotion accompanied by tail erection with crook.

Yawn, facial expression with complete lower jaw dropped.

Locomotion, two or more directed steps in any dimension.

Tactile/Oral Environmental Exploration, exploration or manipulation (e.g., licking) of the inanimate environment which is either tactile or oral in form.

Visual Exploration, subject engaged in no other discernable activity for more than two seconds.

Dorsal-Ventral Contact, contact between subjects including complete dorsal to ventral clinging.

Ventral-Ventral Contact, contact between subjects involving complete ventral to ventral clinging.

Social Contact, physical contact between subjects (excluding tails) not involving dorsal-ventral or ventral-ventral clinging.

Social Play, oriented approach-withdrawal movements and/or rough and tumble interactions excluding agonistic behavior.

Self Play, specific bouncing activity and/or non-stereotypic manual manipulation of the hands.

Social Groom, discrete picking or spreading of the fir of another animal[2] which may include oral components and moaning or lipsmacking.

Mutual Groom, subject both initiating and receiving social grooming behavior with another subject.

Self Groom, grooming behavior (see social groom) directed towards self.
Scratch, individual or repeated pattern of scratching one's body surface.
Groom Present, body posture involving the exposure of the neck and upper arm surfaces to other subjects; usually followed by the receipt of grooming behavior.
Belly Present, body posture involving the exposure of the ventral surface to another subject; often followed by play behavior.
Sexual Present, body posture where the subject lifts his/her tail exposing the anal/genital area of the body.
Sexual Mount, double-clasp sexual mount; initiated or received in either males or females.
Self Sex, oral and/or manual manipulation of the genital areas (excluding self grooming); in males accompanied by an erection of the penis.
Moan/Lipsmack, low frequency and low intensity vocalization often accompanied by rapid movements of the lips.
Screech, high frequency, high intensity vocalization resembling human screech.
Coo, vocalization with rapid changes in frequency which sounds like "Cooooo..."
Other Vocalizations, any other vocal pattern e.g., grunts (low frequency, moderate intensity), bark (low frequency, high intensity) cluck (short single utterances which have a "clicking" tone).
Displacement, initiating a change in the cage position of another subject by the use of physical contact, i.e., brushing another subject off of one's path.

Appendix C

Subject _____ Condition _____ Date _____

	1	2	3	4	5	6	7	8	9	10	tot
SELF CLASP											
OTHER SELF											
SELF BITE											
SELF MOUTH											
HUDDLE											
ROCK											
PACING											
FEAR GRIM.											
THREAT											
AGGRESS											
CHASE											
BAR. ATTACK											
DOM. DISP.											
CROOK TAIL											
YAWN											
LOCOMOTION											
TAC/ORAL											
VIS. EXP											
DORSAL CL.											
VENTRAL CL.											
SOC. CONT.											
SOC. PLAY											
SELF PLAY											
MUTUAL GROOM											
GROOM PRES.											
SOC. GROOM											
SELF GROOM											
SCRATCH											
BELLY PRES.											
SEX PRES.											
SEX MOUNT											
SELF SEX											
MOAN/LIPSM.											
SCREECH											
COO											
OTHER VOC.											
NOTE											
TOTAL											

Appendix D

Pre-Post

Passive Stereotypic Behavior

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	138.8889	1	138.8889
2	A	9.3889	1	9.3889
3	B	34.7222	1	34.7222
4	C	148.6111	8	18.5764
5	S(A)	88.0556	2	44.0278
6	AB	.8889	1	.8889
7	AC	13.1111	8	1.6389
8	BC	205.7778	8	25.7222
9	SB(A)	28.0556	2	14.0278
10	SC(A)	180.9444	16	11.3090
11	ABC	19.6111	8	2.4514
12	SBC(A)	233.9444	16	14.6215

Pre-Post

Active Stereotypic Behavior

ANALYSIS OF VARIANCE FOR DEPENDENT VAPIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	206.7222	1	206.7222
2	A	0.0000	1	0.0000
3	B	1.3889	1	1.3889
4	C	49.7778	8	6.2222
5	S(A)	20.5000	2	10.2500
6	AB	.2222	1	.2222
7	AC	95.0000	8	11.8750
8	BC	67.6111	8	8.4514
9	SB(A)	4.9444	2	2.4722
10	SC(A)	112.0000	16	7.0000
11	ABC	37.2778	8	4.6597
12	SBC(A)	108.5556	16	6.7847

Pre-Post

Agonistic Behavior

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	6.7222	1	6.7222
2	A	2.0000	1	2.0000
3	B	.8889	1	.8889
4	C	1.0278	8	.1285
5	S(A)	4.7222	2	2.3611
6	AB	2.7222	1	2.7222
7	AC	4.7500	8	.5937
8	BC	4.3611	8	.5451
9	SB(A)	1.3889	2	.6944
10	SC(A)	4.7778	16	.2986
11	ABC	3.5278	8	.4410
12	SBC(A)	5.1111	16	.3194

Pre-Post

Dominance Display

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	43.5556	1	43.5556
2	A	8.0000	1	8.0000
3	B	3.5556	1	3.5556
4	C	9.4444	8	1.1806
5	S(A)	24.5556	2	12.2778
6	AB	10.8889	1	10.8889
7	AC	14.5000	8	1.8125
8	BC	23.4444	8	2.9306
9	SB(A)	25.4444	2	12.7222
10	SC(A)	30.9444	16	1.9340
11	ABC	8.6111	8	1.0764
12	SBC(A)	17.0556	16	1.0660

Pre-Post

Locomotion

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	2875.3472	1	2875.3472
2	A	.0139	1	.0139
3	B	141.6806	1	141.6806
4	C	213.7778	8	26.7222
5	S(A)	1.1389	2	.5694
6	AB	25.6806	1	25.6806
7	AC	64.6111	8	8.0764
8	BC	131.4444	8	16.4306
9	SB(A)	26.4722	2	13.2361
10	SC(A)	174.6111	16	10.9132
11	ABC	15.9444	8	1.9931
12	SBC(A)	144.2778	16	9.0174

Pre-Post

Tactile/Oral Exploration

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	1995.0139	1	1995.0139
2	A	48.3472	1	48.3472
3	B	3.1250	1	3.1250
4	C	711.1111	8	88.8889
5	S(A)	23.0278	2	11.5139
6	AB	100.3472	1	100.3472
7	AC	306.2778	8	38.2847
8	BC	400.0000	8	50.0000
9	SB(A)	12.6944	2	6.3472
10	SC(A)	272.7222	16	17.0451
11	ABC	58.2778	8	7.2847
12	SBC(A)	462.0556	16	28.8785

Pre-Post

Visual Exploration

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	5618.0000	1	5618.0000
2	A	20.0556	1	20.0556
3	B	14.2222	1	14.2222
4	C	729.5000	8	91.1875
5	S(A)	42.0556	2	21.0278
6	AB	20.0556	1	20.0556
7	AC	273.9444	8	34.2431
8	BC	378.7778	8	47.3472
9	SB(A)	110.5000	2	55.2500
10	SC(A)	181.4444	16	11.3403
11	ABC	109.4444	8	13.6806
12	SBC(A)	214.0000	16	13.3750

Pre-Post

Social Contact

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	485.6806	1	485.6806
2	A	7.3472	1	7.3472
3	B	3.1250	1	3.1250
4	C	129.6944	8	16.2118
5	S(A)	16.2500	2	8.1250
6	AB	3.1250	1	3.1250
7	AC	37.0278	8	4.6285
8	BC	205.7500	8	25.7187
9	SB(A)	6.1389	2	3.0694
10	SC(A)	97.5000	16	6.0937
11	ABC	56.7500	8	7.0937
12	SBC(A)	128.6111	16	8.0382

Pre-Post

Social Play

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	171.1250	1	171.1250
2	A	100.3472	1	100.3472
3	B	82.3472	1	82.3472
4	C	125.7500	8	15.7188
5	S(A)	36.6944	2	18.3472
6	AB	95.6806	1	95.6806
7	AC	76.5278	8	9.5660
8	BC	116.0278	8	14.5035
9	SB(A)	35.4722	2	17.7361
10	SC(A)	186.0556	16	11.6285
11	ABC	142.6944	8	17.8368
12	SBC(A)	164.2778	16	10.2674

Pre-Post

Self Play

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	.6806	1	.6806
2	A	.3472	1	.3472
3	B	.3472	1	.3472
4	C	1.6944	8	.2118
5	S(A)	.4722	2	.2361
6	AB	.1250	1	.1250
7	AC	2.0278	8	.2535
8	BC	2.0278	8	.2535
9	SB(A)	1.0278	2	.5139
10	SC(A)	4.2778	16	.2674
11	ABC	2.2500	8	.2812
12	SBC(A)	3.7222	16	.2326

Pre-Post

Social Groom

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	3726.7222	1	3726.7222
2	A	72.0000	1	72.0000
3	B	64.2222	1	64.2222
4	C	964.5278	8	120.5660
5	S(A)	146.5000	2	73.2500
6	AB	24.5000	1	24.5000
7	AC	497.2500	8	62.1563
8	BC	656.5278	8	82.0660
9	SB(A)	84.7222	2	42.3611
10	SC(A)	597.0000	16	37.3125
11	ABC	445.2500	8	55.6562
12	SBC(A)	350.7778	16	21.9236

Pre-Post

Self Groom

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	1780.0556	1	1780.0556
2	A	.2222	1	.2222
3	B	4.5000	1	4.5000
4	C	75.9444	8	9.4931
5	S(A)	242.2778	2	121.1389
6	AB	-.0000	1	-.0000
7	AC	96.2778	8	12.0347
8	BC	406.5000	8	50.8125
9	SB(A)	27.3889	2	13.6944
10	SC(A)	245.2222	16	15.3264
11	ABC	103.5000	8	12.9375
12	SBC(A)	222.1111	16	13.8819

Pre-Post

Belly Present

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	16.0556	1	16.0556
2	A	14.2222	1	14.2222
3	B	.8889	1	.8889
4	C	21.9444	8	2.7431
5	S(A)	8.0556	2	4.0278
6	AB	.5000	1	.5000
7	AC	23.2778	8	2.9097
8	BC	13.1111	8	1.6389
9	SB(A)	.0556	2	.0278
10	SC(A)	31.4444	16	1.9653
11	ABC	13.0000	8	1.6250
12	SBC(A)	57.4444	16	3.5903

Pre-Post

Social Sex

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	42.0139	1	42.0139
2	A	5.0139	1	5.0139
3	B	.1250	1	.1250
4	C	6.3611	8	.7951
5	S(A)	7.2500	2	3.6250
6	AB	.6806	1	.6806
7	AC	8.8611	8	1.1076
8	BC	8.2500	8	1.0313
9	SB(A)	.1389	2	.0694
10	SC(A)	31.0000	16	1.9375
11	ABC	10.1944	8	1.2743
12	SBC(A)	21.1111	16	1.3194

Pre-Post

Self Sex

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	3.5556	1	3.5556
2	A	3.5556	1	3.5556
3	B	.8889	1	.8889
4	C	9.6944	8	1.2118
5	S(A)	1.7778	2	.8889
6	AB	.8889	1	.8889
7	AC	9.6944	8	1.2118
8	BC	10.8611	8	1.3576
9	SB(A)	.4444	2	.2222
10	SC(A)	3.7222	16	.2326
11	ABC	10.8611	8	1.3576
12	SBC(A)	8.0556	16	.5035

Pre-Post

Vocalizations

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	793.3472	1	793.3472
2	A	642.0139	1	642.0139
3	B	3.1250	1	3.1250
4	C	86.5278	8	10.8160
5	S(A)	1213.3611	2	606.6806
6	AB	10.1250	1	10.1250
7	AC	81.3611	8	10.1701
8	BC	68.7500	8	8.5937
9	SB(A)	6.3611	2	3.1806
10	SC(A)	108.8889	16	6.8056
11	ABC	69.2500	8	8.6562
12	SBC(A)	123.8889	16	7.7431

Pre-Post

Displacement

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	39.0139	1	39.0139
2	A	.3472	1	.3472
3	B	5.0139	1	5.0139
4	C	31.3611	8	3.9201
5	S(A)	3.4722	2	1.7361
6	AB	1.1250	1	1.1250
7	AC	24.5278	8	3.0660
8	BC	10.8611	8	1.3576
9	SB(A)	.6944	2	.3472
10	SC(A)	34.7778	16	2.1736
11	ABC	8.2500	8	1.0312
12	SBC(A)	17.5556	16	1.0972

Passive Stereotypic Behavior

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	69.4444	1	69.4444
2	A	5.4444	1	5.4444
3	B	16.2222	2	8.1111
4	C	10.8889	2	5.4444
5	S(A)	44.4444	2	22.2222
6	AB	27.5556	2	13.7778
7	AC	28.2222	2	14.1111
8	BC	53.4444	4	13.3611
9	SB(A)	40.2222	4	10.0556
10	SC(A)	34.8889	4	8.7222
11	ABC	77.7778	4	19.4444
12	SBC(A)	169.4444	8	21.1806

Active Stereotypic Behavior

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	633.3611	1	633.3611
2	A	117.3611	1	117.3611
3	B	101.7222	2	50.8611
4	C	166.0556	2	83.0278
5	S(A)	102.9444	2	51.4722
6	AB	117.0556	2	58.5278
7	AC	52.7222	2	26.3611
8	BC	67.1111	4	16.7778
9	SB(A)	14.5556	4	3.6389
10	SC(A)	77.2222	4	19.3056
11	ABC	38.1111	4	9.5278
12	SBC(A)	256.7778	8	32.0972

Agonistic Behavior

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	26.6944	1	26.6944
2	A	23.3611	1	23.3611
3	B	43.7222	2	21.8611
4	C	48.3889	2	24.1944
5	S(A)	5.6111	2	2.8056
6	AB	37.7222	2	18.8611
7	AC	42.0556	2	21.0278
8	BC	78.4444	4	19.6111
9	SB(A)	5.8889	4	1.4722
10	SC(A)	8.2222	4	2.0556
11	ABC	67.1111	4	16.7778
12	SBC(A)	7.7778	8	.9722

Dominance Display

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	169.0000	1	169.0000
2	A	5.4444	1	5.4444
3	B	46.1667	2	23.0833
4	C	18.5000	2	9.2500
5	S(A)	53.5556	2	26.7778
6	AB	8.7222	2	4.3611
7	AC	5.3889	2	2.6944
8	BC	80.3333	4	20.0833
9	SB(A)	37.7778	4	9.4444
10	SC(A)	29.4444	4	7.3611
11	ABC	21.4444	4	5.3611
12	SBC(A)	78.2222	8	9.7778

Locomotion

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	658.7778	1	658.7778
2	A	1.0000	1	1.0000
3	B	66.8889	2	33.4444
4	C	52.7222	2	26.3611
5	S(A)	32.2222	2	16.1111
6	AB	8.0000	2	4.0000
7	AC	31.5000	2	15.7500
8	BC	93.1111	4	23.2778
9	SB(A)	11.1111	4	2.7778
10	SC(A)	36.4444	4	9.1111
11	ABC	46.0000	4	11.5000
12	SBC(A)	54.2222	8	6.7778

Tactile/Oral Exploration

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	3268.0278	1	3268.0278
2	A	8.0278	1	8.0278
3	B	17.5556	2	8.7778
4	C	299.5556	2	149.7778
5	S(A)	51.6111	2	25.8056
6	AB	110.2222	2	55.1111
7	AC	192.8889	2	96.4444
8	BC	470.1111	4	117.5278
9	SB(A)	38.8889	4	9.7222
10	SC(A)	107.5556	4	26.8889
11	ABC	210.1111	4	52.5278
12	SBC(A)	164.4444	8	20.5556

Visual Exploration

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	4876.6944	1	4876.6944
2	A	14.6944	1	14.6944
3	B	396.1556	2	198.0778
4	C	333.5556	2	166.7778
5	S(A)	32.1556	2	16.0778
6	AB	71.7222	2	35.8611
7	AC	22.8889	2	11.4444
8	BC	152.4444	4	38.1111
9	SB(A)	36.4444	4	9.1111
10	SC(A)	39.1111	4	9.7778
11	ABC	66.4444	4	16.6111
12	SBC(A)	130.8889	8	16.3611

Social Contact

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	12.2500	1	12.2500
2	A	.2500	1	.2500
3	B	11.1667	2	5.5833
4	C	2.6667	2	1.3333
5	S(A)	10.1556	2	5.0778
6	AB	2.1667	2	1.0833
7	AC	8.6667	2	4.3333
8	BC	9.6667	4	2.4167
9	SB(A)	13.1111	4	3.2778
10	SC(A)	8.4444	4	2.1111
11	ABC	10.6667	4	2.6667
12	SBC(A)	23.8889	8	2.9861

First Day

Social Play

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	0.0000	1	0.0000
2	A	0.0000	1	0.0000
3	B	0.0000	2	0.0000
4	C	0.0000	2	0.0000
5	S(A)	0.0000	2	0.0000
6	AB	0.0000	2	0.0000
7	AC	0.0000	2	0.0000
8	BC	0.0000	2	0.0000
9	SB(A)	0.0000	4	0.0000
10	SC(A)	0.0000	4	0.0000
11	ABC	0.0000	4	0.0000
12	SBC(A)	0.0000	4	0.0000
		0.0000	8	0.0000

Self Play

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	113.7778	1	113.7778
2	A	1.0000	1	1.0000
3	B	14.3889	2	7.1944
4	C	15.0556	2	7.5278
5	S(A)	107.2222	2	53.6111
6	AB	26.1667	2	13.0833
7	AC	21.1667	2	10.5833
8	BC	85.2778	4	21.3194
9	SB(A)	47.4444	4	11.8611
10	SC(A)	32.4444	4	8.1111
11	ABC	48.1667	4	12.0417
12	SBC(A)	137.8889	8	17.2361

First Day

Social Groom

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	13.4444	1	13.4444
2	A	4.0000	1	4.0000
3	B	10.8889	2	5.4444
4	C	8.2222	2	4.1111
5	S(A)	2.7778	2	1.3889
6	AB	2.0000	2	1.0000
7	AC	2.6667	2	1.3333
8	BC	26.4444	4	6.6111
9	SB(A)	27.5556	4	6.8889
10	SC(A)	17.5556	4	4.3889
11	ABC	5.3333	4	1.3333
12	SBC(A)	25.1111	8	3.1389

Self Groom

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	498.7778	1	498.7778
2	A	53.7778	1	53.7778
3	B	19.0556	2	9.5278
4	C	43.5556	2	21.7778
5	S(A)	7.2222	2	3.6111
6	AB	76.7222	2	38.3611
7	AC	9.5556	2	4.7778
8	BC	65.1111	4	16.2778
9	SB(A)	22.4444	4	5.6111
10	SC(A)	177.7778	4	44.4444
11	ABC	47.4444	4	11.8611
12	SBC(A)	100.5556	8	12.5694

First Day

Belly Present

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	2.7778	1	2.7778
2	A	1.7778	1	1.7778
3	B	2.0556	2	1.0278
4	C	.8889	2	.4444
5	S(A)	4.5556	2	2.2778
6	AB	2.3889	2	1.1944
7	AC	.2222	2	.1111
8	BC	2.7778	4	.6944
9	SB(A)	4.4444	4	1.1111
10	SC(A)	1.1111	4	.2778
11	ABC	4.1111	4	1.0278
12	SBC(A)	6.8889	8	.8611

Social Sex

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	4.0000	1	4.0000
2	A	.1111	1	.1111
3	B	6.1667	2	3.0833
4	C	3.5000	2	1.7500
5	S(A)	4.1111	2	2.0556
6	AB	.0556	2	.0278
7	AC	.7222	2	.3611
8	BC	4.8333	4	1.2083
9	SB(A)	6.2222	4	1.5556
10	SC(A)	4.2222	4	1.0556
11	ABC	2.6111	4	.6528
12	SBC(A)	7.4444	8	.9306

First Day

Self Sex

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	0.0000	1	0.0000
2	A	0.0000	1	0.0000
3	B	0.0000	2	0.0000
4	C	0.0000	2	0.0000
5	S(A)	0.0000	2	0.0000
6	AB	0.0000	2	0.0000
7	AC	0.0000	2	0.0000
8	BC	0.0000	4	0.0000
9	SB(A)	0.0000	4	0.0000
10	SC(A)	0.0000	4	0.0000
11	ABC	0.0000	4	0.0000
12	SBC(A)	0.0000	8	0.0000

Vocalizations

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	373.7778	1	373.7778
2	A	256.0000	1	256.0000
3	B	.0556	2	.0278
4	C	24.0556	2	12.0278
5	S(A)	397.5556	2	198.7778
6	AB	6.5000	2	3.2500
7	AC	5.1667	2	2.5833
8	BC	58.1111	4	14.5278
9	SB(A)	52.1111	4	13.0278
10	SC(A)	24.1111	4	6.0278
11	ABC	48.3333	4	12.0833
12	SBC(A)	44.2222	8	5.5278

First Day

Displacement

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	0.0000	1	0.0000
2	A	0.0000	1	0.0000
3	B	0.0000	2	0.0000
4	C	0.0000	2	0.0000
5	S(A)	0.0000	2	0.0000
6	AB	0.0000	2	0.0000
7	AC	0.0000	2	0.0000
8	BC	0.0000	2	0.0000
9	SB(A)	0.0000	4	0.0000
10	SC(A)	0.0000	4	0.0000
11	ABC	0.0000	4	0.0000
12	SBC(A)	0.0000	4	0.0000
		0.0000	8	0.0000

Longer-term Separation

Passive Stereotypic Behavior

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	861.1250	1	861.1250
2	A	72.0000	1	72.0000
3	B	17.2708	2	8.6354
4	C	2.8958	2	1.4479
5	D	115.9861	7	16.5694
6	S(A)	257.5694	2	128.7847
7	AB	38.5208	2	19.2604
8	AC	98.3125	2	49.1562
9	BC	138.0833	4	34.5208
10	AD	78.3333	7	11.1905
11	BD	102.2847	14	7.3061
12	CD	188.4931	14	13.4638
13	SB(A)	63.0139	4	15.7535
14	SC(A)	74.6806	4	18.6701
15	SD(A)	109.2083	14	7.8006
16	ABC	71.4167	4	17.8542
17	ABD	194.8125	14	13.9152
18	ACD	129.8542	14	9.2753
19	BCD	471.8611	28	16.8522
20	SBC(A)	164.3611	8	20.5451
21	SBD(A)	443.2083	28	15.8289
22	SCD(A)	362.2083	28	12.9360
23	ABCD	293.7500	28	10.4911
24	SBCD(A)	588.7500	56	10.5134

Longer-term Separation

Active Stereotypic Behavior

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	5787.0868	1	5787.0868
2	A	225.7813	1	225.7813
3	B	492.5069	2	246.2535
4	C	4.1111	2	2.0556
5	D	68.3854	7	9.7693
6	S(A)	52.9514	2	26.4757
7	AB	191.6875	2	95.8437
8	AC	19.0833	2	9.5417
9	BC	191.3889	4	47.8472
10	AD	170.8021	7	24.4003
11	BD	154.7708	14	11.0551
12	CD	160.3333	14	11.4524
13	SB(A)	164.8611	4	41.2153
14	SC(A)	576.3611	4	144.0903
15	SD(A)	255.3264	14	18.2376
16	ABC	345.9167	4	86.7292
17	ABD	297.4792	14	21.2485
18	ACD	192.5833	14	13.7560
19	BCD	393.6667	28	13.7024
20	SBC(A)	346.8889	8	43.3611
21	SBD(A)	366.6944	28	13.0962
22	SCD(A)	388.1944	28	13.8641
23	ABCD	435.9167	28	15.5685
24	SBCD(A)	847.2222	56	15.1290

Longer-term Separation

Agonistic Behavior

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	10.1250	1	10.1250
2	A	.1250	1	.1250
3	B	3.3958	2	1.6979
4	C	1.8958	2	.9479
5	D	5.4306	7	.7758
6	S(A)	.8889	2	.4444
7	AB	1.8958	2	.9479
8	AC	.4375	2	.2188
9	BC	2.0833	4	.5208
10	AD	4.6528	7	.6647
11	BD	13.8819	14	.9916
12	CD	4.7153	14	.3368
13	SB(A)	.9861	4	.2465
14	SC(A)	3.4444	4	.8611
15	SD(A)	6.3333	14	.4524
16	ABC	1.2917	4	.3229
17	ABD	6.1597	14	.4400
18	ACD	5.9514	14	.4251
19	BCD	11.4722	28	.4097
20	SBC(A)	3.1806	8	.3976
21	SBD(A)	6.1250	28	.2187
22	SCD(A)	16.0000	28	.5714
23	ABCD	13.4861	28	.4816
24	SBCD(A)	48.0417	56	.8579

Longer-term Separation

Dominance Display

ANALYSIS OF VAPIANCE FOP DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	529.1250	1	528.1250
2	A	39.0139	1	39.0139
3	B	5.7708	2	2.8854
4	C	27.8958	2	13.9479
5	D	12.5417	7	1.7917
6	S(A)	26.9444	2	13.4722
7	AB	37.5903	2	18.7951
8	AC	1.8819	2	.9410
9	BC	11.4583	4	2.8646
10	AD	13.7639	7	1.9663
11	BD	50.5625	14	3.6116
12	CD	49.4375	14	3.5312
13	SB(A)	79.2222	4	19.8056
14	SC(A)	23.1389	4	5.7847
15	SD(A)	58.2778	14	4.1627
16	ABC	52.5139	4	13.1285
17	ABD	18.9653	14	1.3547
18	ACD	34.3403	14	2.4529
19	BCD	98.7083	28	3.5253
20	SBC(A)	38.4444	8	4.8056
21	SBD(A)	86.5556	28	3.0913
22	SCD(A)	125.9722	28	4.4990
23	ABCD	109.4306	28	3.9082
24	SBCD(A)	159.4444	56	2.8472

Longer-term Separation

Locomotion

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	4900.5000	1	4900.5000
2	A	2.0000	1	2.0000
3	B	84.7708	2	42.3854
4	C	49.7500	2	24.8750
5	D	89.1667	7	12.7381
6	S(A)	20.1389	2	10.0694
7	AB	65.0208	2	32.5104
8	AC	15.7500	2	7.8750
9	BC	19.2917	4	4.8229
10	AD	27.0000	7	3.8571
11	BD	123.0625	14	8.7902
12	CD	156.7500	14	11.1964
13	SB(A)	71.7361	4	17.9340
14	SC(A)	125.6111	4	31.4028
15	SD(A)	179.8611	14	12.8472
16	ABC	70.4167	4	17.6042
17	ABD	129.1458	14	9.2247
18	ACD	72.0833	14	5.1488
19	BCD	433.2083	28	15.4717
20	SBC(A)	153.0139	8	19.1267
21	SBD(A)	172.9306	28	6.1761
22	SCD(A)	116.7222	28	4.1687
23	ABCD	168.0833	28	6.0030
24	SBCD(A)	517.9861	56	9.2498

Longer-term Separation

Tactile/Oral Exploration

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	26411.6806	1	26411.6806
2	A	1440.0556	1	1440.0556
3	B	716.3819	2	358.1910
4	C	156.1736	2	78.0868
5	D	184.5417	7	26.3631
6	S(A)	19.9028	2	9.9514
7	AB	299.3819	2	149.6910
8	AC	125.8819	2	62.9410
9	BC	152.3264	4	38.0816
10	AD	88.3889	7	12.6270
11	BD	258.5625	14	18.4687
12	CD	551.7708	14	39.4122
13	SB(A)	137.7639	4	34.4410
14	SC(A)	75.4722	4	18.8681
15	SD(A)	452.3194	14	32.3085
16	ABC	83.3681	4	20.8420
17	ABD	457.3403	14	32.6672
18	ACD	384.5069	14	27.4648
19	BCD	1157.0625	28	41.3237
20	SBC(A)	92.8611	8	11.6076
21	SBD(A)	532.3472	28	19.0124
22	SCD(A)	599.3056	28	21.4038
23	ABCD	864.5764	28	30.8777
24	SBCD(A)	1624.0278	56	29.0005

Longer-term Separation

Visual Exploration

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	59168.0000	1	59168.0000
2	A	171.1250	1	171.1250
3	B	49.1458	2	24.5729
4	C	45.1875	2	22.5938
5	D	51.7778	7	7.3968
6	S(A)	97.6806	2	48.8403
7	AB	51.1875	2	25.5938
8	AC	27.0208	2	13.5104
9	BC	40.2292	4	10.0573
10	AD	72.6528	7	10.3790
11	BD	278.5764	14	19.8983
12	CD	123.2314	14	8.8001
13	SB(A)	87.2778	4	21.8194
14	SC(A)	133.7361	4	33.4340
15	SD(A)	119.8750	14	8.5625
16	ABC	138.4792	4	34.6198
17	ABD	174.2014	14	12.4430
18	ACD	179.0347	14	12.7882
19	BCD	430.3819	28	15.3708
20	SBC(A)	188.9386	8	23.6163
21	SBD(A)	397.1667	28	14.1845
22	SCD(A)	342.0417	28	12.2158
23	ABCD	518.7986	28	18.5285
24	SBCD(A)	1236.2917	56	22.0766

Longer-term Separation

Social Contact

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
MEAN	94.5313	1	94.5313
A	52.5313	1	52.5313
B	32.7708	2	16.3854
C	2.8958	2	1.4479
D	66.0521	7	9.4360
S(A)	2.5347	2	1.2674
AB	36.0208	2	18.0104
AC	5.1458	2	2.5729
BC	9.5833	4	2.3958
AD	73.1632	7	10.4519
BD	46.3958	14	3.3140
CD	30.1042	14	2.1503
SB(A)	5.3194	4	1.3299
SC(A)	71.7361	4	17.9340
SD(A)	9.0764	14	.6483
ABC	24.4583	4	6.1146
ABD	65.0347	14	4.6453
ACD	34.7431	14	2.4816
BCD	111.9167	28	3.9970
SBC(A)	47.0972	8	5.8872
SBD(A)	56.9028	28	2.0322
SCD(A)	65.1528	28	2.3269
ABCD	96.1528	28	3.4340
SBCD(A)	119.6806	56	2.1372

Longer-term Separation

Social Play

ANALYSTS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	.6806	1	.6806
2	A	.5000	1	.5000
3	B	.2986	2	.1493
4	C	.0486	2	.0243
5	D	1.8750	7	.2679
6	S(A)	.1806	2	.0903
7	AB	.4375	2	.2188
8	AC	.0208	2	.0104
9	AD	.5972	4	.1493
10	BC	2.0556	7	.2937
11	BD	4.8125	14	.3437
12	CD	1.7292	14	.1235
13	SB(A)	.0694	4	.0174
14	SC(A)	.7361	4	.1840
15	SD(A)	.4861	14	.0347
16	ABC	.6667	4	.1667
17	ABD	4.6736	14	.3338
18	ACD	1.7569	14	.1255
19	BCD	2.9583	28	.1057
20	SBC(A)	2.2639	8	.2830
21	SBD(A)	1.2639	28	.0451
22	SCD(A)	7.2639	28	.2594
23	ABCD	2.8889	28	.1032
24	SBCD(A)	13.7361	56	.2453

Longer-term Separation

Self Play

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOUPCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	145.9201	1	145.9201
2	A	10.5035	1	10.5035
3	B	26.2569	2	13.1285
4	C	4.4236	2	2.2118
5	D	23.1632	7	3.3090
6	S(A)	142.4236	2	71.2118
7	AB	16.3403	2	8.1701
8	AC	22.9236	2	11.4618
9	BC	16.7431	4	4.1858
10	AD	25.3576	7	3.6225
11	BD	46.9097	14	3.3507
12	CD	29.2431	14	2.0888
13	SB(A)	46.2639	4	11.5660
14	SC(A)	24.0139	4	6.0035
15	SD(A)	51.4097	14	3.6721
16	ABC	16.4514	4	4.1128
17	ABD	48.7153	14	3.4797
18	ACD	33.6319	14	2.4023
19	BCD	111.0903	28	3.9675
20	SBC(A)	42.3611	8	5.2951
21	SBD(A)	97.7361	28	3.4906
22	SCD(A)	65.3194	28	2.3328
23	ABCD	108.8264	28	3.8867
24	SBCD(A)	210.9722	56	3.7674

Longer-term Separation

Social Groom

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	61.4201	1	61.4201
2	A	.0035	1	.0035
3	B	117.3819	2	58.6910
4	C	.2986	2	.1493
5	D	21.6632	7	3.0947
6	S(A)	1.7847	2	.8924
7	AB	.1319	2	.0660
8	AC	11.0486	2	5.5243
9	BC	.4306	4	.1076
10	AD	11.7465	7	1.6781
11	BD	43.7847	14	3.1275
12	CD	66.7014	14	4.7644
13	SB(A)	2.4028	4	.6007
14	SC(A)	33.9028	4	8.4757
15	SD(A)	43.2708	14	3.0908
16	ABC	19.0972	4	4.7743
17	ABD	25.0347	14	1.7882
18	ACD	34.6181	14	2.4727
19	BCD	129.5694	28	4.6275
20	SBC(A)	70.9722	8	8.8715
21	SBD(A)	87.0417	28	3.1086
22	SCD(A)	61.8750	28	2.2098
23	ABCD	75.5694	28	2.6989
24	SBCD(A)	125.2500	56	2.2366

Longer-term Separation

Self Groom

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	11793.9201	1	11793.9201
2	A	148.7813	1	148.7813
3	B	189.5278	2	94.7639
4	C	106.5903	2	53.2951
5	D	181.8954	7	25.9836
6	S(A)	158.5903	2	79.2951
7	AB	28.0000	2	14.0000
8	AC	15.4375	2	7.7187
9	BC	52.5556	4	13.1389
10	AD	196.4688	7	28.0670
11	BD	420.5833	14	30.0417
12	CD	447.3542	14	31.9539
13	SB(A)	109.3889	4	27.3472
14	SC(A)	80.2222	4	20.0556
15	SD(A)	243.5764	14	17.3983
16	ABC	267.3750	4	66.8437
17	ABD	347.0000	14	24.7857
18	ACD	102.0625	14	7.2902
19	BCD	548.8333	28	19.6012
20	SBC(A)	149.2361	8	18.6545
21	SBD(A)	393.9444	28	14.0694
22	SCD(A)	340.1111	28	12.1468
23	ABCD	372.1250	28	13.2902
24	SBCD(A)	1181.4306	56	21.0970

Longer-term Separation

Belly Present

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	2.0000	1	2.0000
2	A	1.1250	1	1.1250
3	B	1.5625	2	.7813
4	C	.6458	2	.3229
5	D	1.7222	7	.2460
6	S(A)	.3472	2	.1736
7	AB	1.0208	2	.5104
8	AC	1.1875	2	.5938
9	BC	.7917	4	.1979
10	AD	2.1528	7	.3075
11	BD	3.7153	14	.2654
12	CD	6.7986	14	.4856
13	SB(A)	1.1111	4	.2778
14	SC(A)	.6944	4	.1736
15	SD(A)	2.8750	14	.2054
16	ABC	.9167	4	.2292
17	ABD	3.3681	14	.2406
18	ACD	5.3681	14	.3834
19	BCD	9.7639	28	.3487
20	SBC(A)	5.0972	8	.6372
21	SBD(A)	9.6667	28	.3452
22	SCD(A)	5.7500	28	.2054
23	ABCD	7.8611	28	.2808
24	SBCD(A)	16.4583	56	.2939

Longer-term Separation

Social Sex

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	7.6701	1	7.6701
2	A	2.1701	1	2.1701
3	B	1.7153	2	.8576
4	C	7.9236	2	3.9618
5	D	1.3576	7	.1939
6	S(A)	9.0069	2	4.5035
7	AB	1.3403	2	.6701
8	AC	2.2569	2	1.1285
9	BC	3.8472	4	.9618
10	AD	1.5243	7	.2178
11	BD	7.6736	14	.5481
12	CD	4.6319	14	.3309
13	SB(A)	3.1399	4	.7847
14	SC(A)	9.3472	4	2.3368
15	SD(A)	3.7153	14	.2654
16	ABC	7.7639	4	1.9410
17	ABD	10.0486	14	.7178
18	ACD	5.9653	14	.4261
19	BCD	13.4306	28	.4797
20	SBC(A)	11.9444	8	1.4931
21	SBD(A)	17.6389	28	.6300
22	SCD(A)	11.4306	28	.4082
23	ABCD	17.1806	28	.6136
24	SBCD(A)	30.2778	56	.5407

Longer-term Separation

Self Sex

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	.5000	1	.5000
2	A	.0556	1	.0556
3	B	.0208	2	.0104
4	C	.4375	2	.2188
5	D	.6667	7	.0952
6	S(A)	.5556	2	.2778
7	AB	.2986	2	.1493
8	AC	.5486	2	.2743
9	BC	.6042	4	.1510
10	AD	1.1111	7	.1587
11	BD	2.3125	14	.1652
12	CD	1.8958	14	.1354
13	SB(A)	.3194	4	.0799
14	SC(A)	.9861	4	.2465
15	SD(A)	1.7778	14	.1270
16	ABC	.1597	4	.0399
17	ABD	2.0347	14	.1453
18	ACD	1.7847	14	.1275
19	BCD	4.0625	28	.1451
20	SBC(A)	.7639	8	.0955
21	SBD(A)	4.3472	28	.1553
22	SCD(A)	3.6806	28	.1314
23	ABCD	4.5069	28	.1610
24	SBCD(A)	8.5694	56	.1530

Longer-term Separation

Vocalizations

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	4035.0139	1	4035.0139
2	A	3741.1250	1	3741.1250
3	B	6.9236	2	3.4618
4	C	18.7778	2	9.3889
5	D	19.0417	7	2.7202
6	S(A)	4855.6944	2	2427.8472
7	AB	11.2708	2	5.6354
8	AC	23.2500	2	11.6250
9	BC	30.4722	4	7.6181
10	AD	26.3750	7	3.7679
11	BD	151.3542	14	10.8110
12	CD	63.1667	14	4.5119
13	SB(A)	35.2222	4	8.8056
14	SC(A)	153.3889	4	38.3472
15	SD(A)	45.8611	14	3.2758
16	ABC	46.2917	4	11.5729
17	ABD	144.2292	14	10.3021
18	ACD	54.5833	14	3.8988
19	BCD	170.2500	28	6.0804
20	SBC(A)	19.3194	8	2.4149
21	SBD(A)	292.5556	28	10.4484
22	SCD(A)	154.3889	28	5.5139
23	ABCD	193.8750	28	6.9241
24	SBCD(A)	369.5694	56	6.5995

Longer-term Separation

Displacement

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	0.0000	1	0.0000
2	A	0.0000	1	0.0000
3	B	0.0000	2	0.0000
4	C	0.0000	2	0.0000
5	D	0.0000	7	0.0000
6	S(A)	0.0000	2	0.0000
7	AB	0.0000	2	0.0000
8	AC	0.0000	2	0.0000
9	BC	0.0000	4	0.0000
10	AD	0.0000	7	0.0000
11	BD	0.0000	14	0.0000
12	CD	0.0000	14	0.0000
13	SB(A)	0.0000	4	0.0000
14	SC(A)	0.0000	4	0.0000
15	SD(A)	0.0000	14	0.0000
16	ABC	0.0000	4	0.0000
17	ABD	0.0000	14	0.0000
18	ACD	0.0000	14	0.0000
19	BCD	0.0000	28	0.0000
20	SBC(A)	0.0000	8	0.0000
21	SBD(A)	0.0000	28	0.0000
22	SCD(A)	0.0000	28	0.0000
23	ABCD	0.0000	28	0.0000
24	SBCD(A)	0.0000	56	0.0000

Reunion

Passive Stereotypic Behavior

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	120.3333	1	120.3333
2	A	.0370	1	.0370
3	B	24.2222	2	12.1111
4	C	22.2222	2	11.1111
5	D	17.5556	2	8.7778
6	S(A)	53.7037	2	26.8519
7	AB	1.1852	2	.5926
8	AC	10.9630	2	5.4815
9	BC	65.7222	4	16.4306
10	AD	4.5185	2	2.2593
11	BD	17.3889	4	4.3472
12	CD	61.2222	4	15.3056
13	SB(A)	48.9630	4	12.2407
14	SC(A)	23.4074	4	5.8519
15	SD(A)	29.8519	4	7.4630
16	ABC	9.6481	4	2.4120
17	ABD	16.0926	4	4.0231
18	ACD	8.4815	4	2.1204
19	BCD	85.8333	8	10.7292
20	SBC(A)	55.5926	8	6.9491
21	SBD(A)	44.8148	8	5.6019
22	SCD(A)	114.3704	8	14.2963
23	ABCD	46.5741	8	5.8218
24	SBCD(A)	125.2963	16	7.8310

Reunion

Active Stereotypic Behavior

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	872.6759	1	872.6759
2	A	20.4537	1	20.4537
3	B	2.0185	2	1.0093
4	C	11.2407	2	5.6204
5	D	93.5741	2	46.7870
6	S(A)	174.5370	2	87.2685
7	AB	68.6852	2	34.3426
8	AC	11.7963	2	5.8981
9	BC	35.9815	4	8.9954
10	AD	7.4630	2	3.7315
11	BD	149.4815	4	37.3704
12	CD	35.5926	4	8.8981
13	SB(A)	36.4074	4	9.1019
14	SC(A)	67.4074	4	16.8519
15	SD(A)	96.7407	4	24.1852
16	ABC	90.9815	4	22.7454
17	ABD	69.4815	4	17.3704
18	ACD	142.0370	4	35.5093
19	BCD	31.1852	8	3.8981
20	SBC(A)	194.1481	8	24.2685
21	SBD(A)	109.4815	8	13.6852
22	SCD(A)	94.1481	8	11.7685
23	ABCD	79.8519	8	9.9815
24	SBCD(A)	389.6296	16	24.3519

Reunion

Agonistic Behavior

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	10.0833	1	10.0833
2	A	5.7870	1	5.7870
3	B	2.1667	2	1.0833
4	C	2.8889	2	1.4444
5	D	.1667	2	.0833
6	S(A)	4.4630	2	2.2315
7	AB	2.0185	2	1.0093
8	AC	.9630	2	.4815
9	BC	1.2778	4	.3194
10	AD	.5741	2	.2870
11	BD	2.8333	4	.7083
12	CD	5.2778	4	1.3194
13	SB(A)	.4815	4	.1204
14	SC(A)	5.0370	4	1.2593
15	SD(A)	4.5926	4	1.1481
16	ABC	1.3148	4	.3287
17	ABD	1.2037	4	.3009
18	ACD	10.0926	4	2.5231
19	BCD	6.5556	8	.8194
20	SBC(A)	3.1852	8	.3981
21	SBD(A)	7.9630	8	.9954
22	SCD(A)	9.7407	8	1.2176
23	ABCD	7.2963	8	.9120
24	SBCD(A)	7.0370	16	.4398

Reunion

Dominance Display

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	83.5648	1	83.5648
2	A	26.0093	1	26.0093
3	B	.9074	2	.4537
4	C	.2963	2	.1481
5	D	7.1852	2	3.5926
6	S(A)	32.7593	2	16.3796
7	AB	1.1296	2	.5648
8	AC	.2963	2	.1481
9	BC	.1481	4	.0370
10	AD	4.9630	2	2.4815
11	BD	20.9259	4	5.2315
12	CD	5.0370	4	1.2593
13	SB(A)	8.4074	4	2.1019
14	SC(A)	6.5185	4	1.6296
15	SD(A)	1.1852	4	.2963
16	ABC	2.1481	4	.5370
17	ABD	13.4815	4	3.3704
18	ACD	4.8148	4	1.2037
19	BCD	19.6852	8	2.4606
20	SBC(A)	20.1481	8	2.5185
21	SBD(A)	13.8148	8	1.7269
22	SCD(A)	13.0370	8	1.6296
23	ABCD	23.9074	8	2.9884
24	SBCD(A)	20.6296	16	1.2894

Reunion

Locomotion

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

SOURCE		SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	4947.7870	1	4947.7870
2	A	98.2315	1	98.2315
3	B	7.4630	2	3.7315
4	C	3.1852	2	1.5926
5	D	93.4074	2	46.7037
6	S(A)	30.8333	2	15.4167
7	AB	14.5741	2	7.2870
8	AC	22.2963	2	11.1481
9	BC	137.1481	4	34.2870
10	AD	10.2963	2	5.1481
11	BD	239.4259	4	59.6065
12	CD	77.8704	4	19.4676
13	SB(A)	23.4444	4	5.8611
14	SC(A)	188.4444	4	47.1111
15	SD(A)	56.8889	4	14.2222
16	ABC	62.8148	4	15.7037
17	ABD	1.3148	4	.3287
18	ACD	96.4259	4	24.1065
19	BCD	34.9630	8	4.3704
20	SBC(A)	120.7778	8	15.0972
21	SBD(A)	49.0000	8	6.1250
22	SCD(A)	104.6667	8	13.0833
23	ABCD	57.2963	8	7.1620
24	SBCD(A)	233.4444	15	14.5903

Reunion

Tactile/Oral Exploration

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	4800.0000	1	4800.0000
2	A	578.7037	1	578.7037
3	B	20.2222	2	10.1111
4	C	40.3889	2	20.1944
5	D	506.0556	2	253.0278
6	S(A)	27.5926	2	13.7963
7	AB	52.0741	2	26.0370
8	AC	39.2407	2	19.6204
9	BC	93.7222	4	23.4306
10	AD	55.5741	2	27.7870
11	BD	504.8889	4	126.2222
12	CD	328.7222	4	82.1806
13	SB(A)	34.5185	4	8.6296
14	SC(A)	33.1852	4	8.2963
15	SD(A)	57.1852	4	14.2963
16	ABC	15.9815	4	3.9954
17	ABD	163.8148	4	40.9537
18	ACD	71.9815	4	17.9954
19	BCD	744.0000	8	93.0000
20	SBC(A)	314.3704	8	39.2963
21	SBD(A)	197.3704	8	24.6713
22	SCD(A)	180.7037	8	22.5880
23	ABCD	123.6296	8	15.4537
24	SBCD(A)	392.0741	16	24.5046

Reunion

Visual Exploration

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	12033.3333	1	12033.3333
2	A	116.1481	1	116.1481
3	B	79.3889	2	39.6944
4	C	.3889	2	.1944
5	D	717.7222	2	358.8611
6	S(A)	432.5926	2	216.2963
7	AB	111.4630	2	55.7315
8	AC	13.6852	2	6.8426
9	BC	100.2222	4	25.0556
10	AD	3.1296	2	1.5648
11	BD	90.8889	4	22.7222
12	CD	5.8889	4	1.4722
13	SB(A)	69.7407	4	17.4352
14	SC(A)	85.1852	4	21.2963
15	SD(A)	112.1852	4	28.0463
16	ABC	79.7037	4	19.9259
17	ABD	186.5926	4	46.6481
18	ACD	117.0370	4	29.2593
19	BCD	370.1667	8	46.2708
20	SBC(A)	474.8148	8	59.3519
21	SBD(A)	138.1481	8	17.2685
22	SCD(A)	162.7037	8	20.3380
23	ABCD	120.2407	8	15.0301
24	SBCD(A)	276.6296	16	17.2894

Reunion

Social Contact

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	507.0000	1	507.0000
2	A	25.0370	1	25.0370
3	B	4.5000	2	2.2500
4	C	26.7222	2	13.3611
5	D	33.5000	2	16.7500
6	S(A)	144.1852	2	72.0926
7	AB	5.2407	2	2.6204
8	AC	3.5741	2	1.7870
9	BC	46.4444	4	11.6111
10	AD	8.9074	2	4.4537
11	BD	75.3333	4	18.8333
12	CD	18.1111	4	4.5278
13	SB(A)	16.2593	4	4.0648
14	SC(A)	22.3704	4	5.5926
15	SD(A)	43.3704	4	10.8426
16	ABC	20.8148	4	5.2037
17	ABD	19.8148	4	4.9537
18	ACD	25.1481	4	6.2870
19	BCD	34.8889	8	4.3611
20	SBC(A)	116.5185	8	14.5648
21	SBD(A)	104.8519	8	13.1065
22	SCD(A)	100.0741	8	12.5093
23	ABCD	74.9630	8	9.3704
24	SBCD(A)	68.3704	16	4.2731

Reunion

Social Play

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	36.7500	1	36.7500
2	A	1.5648	1	1.5648
3	B	5.0556	2	2.5278
4	C	19.0556	2	9.5278
5	D	1.7222	2	.8611
6	S(A)	2.3148	2	1.1574
7	AB	12.4630	2	6.2315
8	AC	6.7963	2	3.3981
9	BC	8.5556	4	2.1389
10	AD	4.0185	2	2.0093
11	BD	19.7222	4	4.9306
12	CD	2.2222	4	.5556
13	SB(A)	3.7407	4	.9352
14	SC(A)	.2963	4	.0741
15	SD(A)	2.6296	4	.6574
16	ABC	21.9259	4	5.4815
17	ABD	12.8704	4	3.2176
18	ACD	7.7037	4	1.9259
19	BCD	15.1667	8	1.8958
20	SBC(A)	23.1481	8	2.8935
21	SBD(A)	12.8148	8	1.6019
22	SCD(A)	39.9259	8	4.9907
23	ABCD	15.9074	8	1.9884
24	SBCD(A)	38.6296	16	2.4144

Reunion

Self Play

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	1.8148	1	1.8148
2	A	.0370	1	.0370
3	B	.9074	2	.4537
4	C	.0185	2	.0093
5	D	.6852	2	.3426
6	S(A)	1.3333	2	.6667
7	AB	.1296	2	.0648
8	AC	1.3519	2	.6759
9	BC	1.0926	4	.2731
10	AD	.6852	2	.3426
11	BD	1.4259	4	.3565
12	CD	1.1481	4	.2870
13	SB(A)	.8889	4	.2222
14	SC(A)	1.2222	4	.3056
15	SD(A)	1.8889	4	.4722
16	ABC	1.6481	4	.4120
17	ABD	.6481	4	.1620
18	ACD	.9259	4	.2315
19	BCD	2.4074	8	.3009
20	SBC(A)	3.5556	8	.4444
21	SBD(A)	2.2222	8	.2778
22	SCD(A)	2.2222	8	.2778
23	ABCD	2.0741	8	.2593
24	SBCD(A)	3.6667	16	.2292

Reunion

Social Groom

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	5561.3426	1	5561.3426
2	A	26.0093	1	26.0093
3	B	80.9630	2	40.4815
4	C	126.1296	2	63.0648
5	D	2167.7963	2	1083.8981
6	S(A)	235.2037	2	117.6019
7	AB	8.9630	2	4.4815
8	AC	17.7963	2	8.8981
9	BC	108.1481	4	27.0370
10	AD	.0185	2	.0093
11	BD	534.8148	4	133.7037
12	CD	229.1481	4	57.2870
13	SB(A)	34.5185	4	8.6296
14	SC(A)	226.2963	4	56.5741
15	SD(A)	136.8519	4	34.2130
16	ABC	100.1481	4	25.0370
17	ABD	67.9259	4	16.9815
18	ACD	124.2593	4	31.0648
19	BCD	954.4074	8	119.3009
20	SBC(A)	462.8148	8	57.8519
21	SBD(A)	297.9259	8	37.2407
22	SCD(A)	341.4815	8	42.6852
23	ABCD	51.6296	8	6.4537
24	SBCD(A)	230.4074	16	14.4005

Reunion

Self Groom

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	1866.6759	1	1866.6759
2	A	140.0833	1	140.0833
3	B	100.4630	2	50.2315
4	C	50.3519	2	25.1759
5	D	61.5741	2	30.7870
6	S(A)	108.6852	2	54.3426
7	AB	117.3889	2	58.6944
8	AC	92.1667	2	46.0833
9	BC	9.9259	4	2.4815
10	AD	145.1667	2	72.5833
11	BD	44.0370	4	11.0093
12	CD	6.3148	4	1.5787
13	SB(A)	101.2593	4	25.3148
14	SC(A)	31.7037	4	7.9259
15	SD(A)	510.8148	4	127.7037
16	ABC	71.7778	4	17.9444
17	ABD	38.7778	4	9.6944
18	ACD	46.1667	4	11.5417
19	BCD	92.9074	8	11.6134
20	SBC(A)	63.8519	8	7.9815
21	SBD(A)	160.7407	8	20.0926
22	SCD(A)	61.2963	8	7.6620
23	ABCD	76.7222	8	9.5903
24	SBCD(A)	188.1481	15	11.7593

Reunion

Belly Present

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	12.6759	1	12.6759
2	A	12.6759	1	12.6759
3	B	3.9074	2	1.9537
4	C	.5185	2	.2593
5	D	.2407	2	.1204
6	S(A)	.0185	2	.0093
7	AB	3.9074	2	1.9537
8	AC	.5185	2	.2593
9	BC	2.8148	4	.7037
10	AD	.2407	2	.1204
11	BD	2.4259	4	.6065
12	CD	9.8148	4	2.4537
13	SB(A)	1.5926	4	.3981
14	SC(A)	5.3704	4	1.5926
15	SD(A)	1.8148	4	.4537
16	ABC	2.8148	4	.7037
17	ABD	2.4259	4	.6065
18	ACD	9.8148	4	2.4537
19	BCD	23.3519	8	2.9190
20	SBC(A)	18.5185	8	2.3148
21	SBD(A)	21.0741	8	2.6343
22	SCD(A)	12.2963	8	1.5370
23	ABCD	23.3519	8	2.9190
24	SBCD(A)	13.8148	16	.8634

Reunion

Social Sex

ANALYSIS OF VARIANCE FOR DEPENDENT VAPIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	46.6759	1	46.6759
2	A	4.8981	1	4.8981
3	B	1.3519	2	.6759
4	C	2.0741	2	1.0370
5	D	2.3519	2	1.1759
6	S(A)	25.3519	2	12.6759
7	AB	4.0185	2	2.0093
8	AC	8.0741	2	4.0370
9	BC	7.8148	4	1.9537
10	AD	4.5741	2	2.2870
11	BD	12.0370	4	3.0093
12	CD	12.6481	4	3.1620
13	SB(A)	2.9259	4	.7315
14	SC(A)	8.1481	4	2.0370
15	SD(A)	7.8148	4	1.9537
16	ABC	7.2593	4	1.8148
17	ABD	3.9259	4	.9815
18	ACD	3.5370	4	.8843
19	BCD	10.2963	8	1.2870
20	SBC(A)	11.0741	8	1.3843
21	SBD(A)	19.7407	8	2.4676
22	SCD(A)	10.8519	8	1.3565
23	ABCD	11.9630	8	1.4954
24	SBCD(A)	19.5926	16	1.2245

Reunion

Self Sex

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	1.8148	1	1.8148
2	A	1.8148	1	1.8148
3	B	.5185	2	.2593
4	C	1.2407	2	.6204
5	D	1.1296	2	.5648
6	S(A)	1.8519	2	.9259
7	AB	.5185	2	.2593
8	AC	1.2407	2	.6204
9	BC	1.2593	4	.3148
10	AD	1.1296	2	.5648
11	BD	2.3704	4	.5926
12	CD	.6481	4	.1620
13	SB(A)	.1481	4	.0370
14	SC(A)	3.8148	4	.9537
15	SD(A)	1.3704	4	.3426
16	ABC	1.2593	4	.3148
17	ABD	2.3704	4	.5926
18	ACD	.6481	4	.1620
19	BCD	5.5185	8	.6898
20	SBC(A)	3.8519	8	.4815
21	SBD(A)	4.2963	8	.5370
22	SCD(A)	2.6296	8	.3287
23	ABCD	5.5185	8	.6898
24	SBCD(A)	11.0370	16	.6898

Reunion

Vocalizations

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	948.1481	1	948.1481
2	A	768.0000	1	768.0000
3	B	41.7963	2	20.8981
4	C	12.5741	2	6.2870
5	D	56.2407	2	28.1204
6	S(A)	1539.6296	2	769.8148
7	AB	24.3889	2	12.1944
8	AC	14.3889	2	7.1944
9	BC	31.1481	4	7.7870
10	AD	55.1667	2	27.5833
11	BD	46.8148	4	11.7037
12	CD	9.3704	4	2.3426
13	SB(A)	124.7037	4	31.1759
14	SC(A)	30.5926	4	7.6481
15	SD(A)	75.9259	4	18.9815
16	ABC	44.5556	4	11.1389
17	ABD	44.1111	4	11.0278
18	ACD	16.4444	4	4.1111
19	BCD	92.9074	8	11.6134
20	SBC(A)	106.0741	8	13.2593
21	SBD(A)	59.7407	8	7.4676
22	SCD(A)	26.1852	8	3.2731
23	ABCD	70.9444	8	8.8681
24	SBCD(A)	122.1481	16	7.6343

Reunion

Displacement

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	65.3333	1	65.3333
2	A	9.4815	1	9.4815
3	B	7.7222	2	3.8611
4	C	2.0556	2	1.0278
5	D	24.0000	2	12.0000
6	S(A)	24.2963	2	12.1481
7	AB	9.2407	2	4.6204
8	AC	4.2407	2	2.1204
9	BC	14.7222	4	3.6806
10	AD	11.1852	2	5.5926
11	BD	21.7778	4	5.4444
12	CD	6.7778	4	1.6944
13	SB(A)	25.4815	4	6.3704
14	SC(A)	10.5926	4	2.6481
15	SD(A)	11.9259	4	2.9815
16	ABC	11.2037	4	2.8009
17	ABD	5.5926	4	1.3981
18	ACD	10.9259	4	2.7315
19	BCD	18.1111	8	2.2639
20	SBC(A)	27.6296	8	3.4537
21	SBD(A)	34.6296	8	4.3287
22	SCD(A)	15.1852	8	1.8981
23	ABCD	15.6296	8	1.9537
24	SBCD(A)	48.2593	16	3.0162

Wire, Clear, Opaque versus Reunion

Passive Stereotypic Behavior

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	934.3776	1	934.3776
2	A	65.8359	1	65.8359
3	B	50.2786	3	16.7595
4	C	1.8958	2	.9479
5	D	83.8516	7	11.9788
6	S(A)	288.1510	2	144.0755
7	AB	47.0286	3	15.6762
8	AC	75.2500	2	37.6250
9	BC	166.9792	6	27.8299
10	AD	47.6432	7	6.8062
11	BD	235.4089	21	11.2099
12	CD	221.5625	14	15.8259
13	SB(A)	72.4531	6	12.0755
14	SC(A)	59.0208	4	14.7552
15	SD(A)	61.2240	14	4.3731
16	ABC	96.4167	6	16.0694
17	ABD	233.0755	21	11.0988
18	ACD	136.9583	14	9.7827
19	BCD	597.8958	42	14.2356
20	SBC(A)	236.9375	12	19.7448
21	SBD(A)	652.3385	42	15.5319
22	SCD(A)	330.9792	28	11.8207
23	ABCD	352.0417	42	8.3819
24	SBCD(A)	817.3958	84	9.7309

Wire, Clear, Opaque versus Reunion

Active Stereotypic Behavior

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	6240.3750	1	6240.3750
2	A	128.3438	1	128.3438
3	B	727.2292	3	242.4097
4	C	8.6406	2	4.3203
5	D	84.4583	7	12.0655
6	S(A)	2.6771	2	1.3385
7	AB	300.4588	3	100.1563
8	AC	8.9219	2	4.4609
9	BC	192.7552	6	32.1259
10	AD	101.8229	7	14.5461
11	BD	255.4375	21	12.1637
12	CD	229.6510	14	16.4036
13	SB(A)	367.6563	6	61.2760
14	SC(A)	399.9792	4	99.9948
15	SD(A)	327.1563	14	23.3683
16	ABC	413.5156	6	68.9193
17	ABD	520.5312	21	24.7872
18	ACD	172.5365	14	12.3240
19	BCD	504.9531	42	12.0227
20	SBC(A)	581.9375	12	48.4948
21	SBD(A)	548.5104	42	13.0598
22	SCD(A)	428.9375	28	15.3192
23	ABCD	662.3594	42	15.7705
24	SBCD(A)	1345.1458	84	16.0136

Wire, Clear, Opaque versus Reunion

Agonistic Behavior

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	17.9401	1	17.9401
2	A	.5859	1	.5859
3	B	4.3411	3	1.4470
4	C	1.7552	2	.8776
5	D	5.4974	7	.7853
6	S(A)	2.8385	2	1.4193
7	AB	6.0286	3	2.0095
8	AC	.1094	2	.0547
9	BC	5.3698	6	.8950
10	AD	6.3516	7	.9074
11	BD	22.1380	21	1.0542
12	CD	7.1198	14	.5086
13	SB(A)	4.0573	6	.6762
14	SC(A)	3.4271	4	.8568
15	SD(A)	4.0365	14	.2883
16	ABC	4.6823	6	.7804
17	ABD	15.9505	21	.7595
18	ACD	7.0156	14	.5011
19	BCD	18.0885	42	.4307
20	SBC(A)	4.7396	12	.3950
21	SBD(A)	27.2344	42	.6484
22	SCD(A)	16.0729	28	.5740
23	ABCD	20.5260	42	.4887
24	SBCD(A)	61.0937	84	.7273

Wire, Clear, Opaque versus Reunion

Dominance Display

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	615.0938	1	615.0938
2	A	54.0000	1	54.0000
3	B	22.5104	3	7.5035
4	C	23.2500	2	11.6250
5	D	20.9479	7	2.9926
6	S(A)	56.4271	2	28.2135
7	AB	30.7708	3	10.2569
8	AC	.5625	2	.2812
9	BC	28.8333	6	4.8056
10	AD	10.2083	7	1.4583
11	BD	64.4479	21	3.0689
12	CD	38.2083	14	2.7292
13	SB(A)	92.2812	6	15.3802
14	SC(A)	27.9167	4	6.9792
15	SD(A)	52.8229	14	3.7731
16	ABC	42.7292	6	7.1215
17	ABD	41.6875	21	1.9851
18	ACD	29.9792	14	2.1414
19	BCD	167.7083	42	3.9931
20	SBC(A)	46.3750	12	3.8646
21	SBD(A)	112.1354	42	2.6699
22	SCD(A)	138.5833	28	4.9494
23	ABCD	161.0625	42	3.8348
24	SBCD(A)	243.4583	84	2.8983

Wire, Clear, Opaque versus Reunion

Locomotion

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	8864.6484	1	8864.6484
2	A	43.3359	1	43.3359
3	B	616.9661	3	205.6554
4	C	40.2344	2	20.1172
5	D	78.2057	7	11.1722
6	S(A)	9.2760	2	4.6380
7	AB	138.5286	3	46.1762
8	AC	2.6406	2	1.3203
9	BC	37.1198	6	6.1866
10	AD	64.3516	7	9.1931
11	BD	303.5964	21	14.4570
12	CD	170.5990	14	12.1856
13	SB(A)	92.5365	6	15.4227
14	SC(A)	60.2708	4	15.0677
15	SD(A)	263.9323	14	18.8523
16	ABC	98.5885	6	16.4314
17	ABD	203.8672	21	9.7080
18	ACD	92.1094	14	6.5792
19	BCD	810.3802	42	19.2948
20	SBC(A)	257.9792	12	21.4983
21	SBD(A)	399.7552	42	9.5180
22	SCD(A)	210.1458	28	7.5052
23	ABCD	248.3281	42	5.9126
24	SBCD(A)	779.6042	84	9.2810

Wire, Clear, Opaque versus Reunion

Tactile/Oral Exploration

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	29751.0417	1	29751.0417
2	A	2007.5104	1	2007.5104
3	B	1407.0625	3	469.0208
4	C	219.4427	2	109.7214
5	D	114.3750	7	16.3393
6	S(A)	56.9271	2	28.4635
7	AB	302.3021	3	100.7674
8	AC	60.1927	2	30.0964
9	BC	154.3281	6	25.7214
10	AD	35.5729	7	5.0818
11	BD	1173.5208	21	55.8819
12	CD	565.1406	14	40.3672
13	SB(A)	166.1563	6	27.6927
14	SC(A)	85.8854	4	21.4714
15	SD(A)	387.2396	14	27.6600
16	ABC	165.2448	6	27.5408
17	ABD	663.9479	21	31.6166
18	ACD	232.9740	14	16.6410
19	BCD	2335.0885	42	55.5973
20	SBC(A)	143.4062	12	11.9505
21	SBD(A)	742.3437	42	17.6749
22	SCD(A)	720.6979	28	25.7392
23	ABCD	1249.2552	42	29.7442
24	SBCD(A)	2222.3437	84	26.4565

Wire, Clear, Opaque versus Reunion

Visual Exploration

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	68908.1667	1	68908.1667
2	A	256.7604	1	256.7604
3	B	1061.6458	3	353.8819
4	C	18.7865	2	9.3932
5	D	220.1667	7	31.4524
6	S(A)	308.1354	2	154.0677
7	AB	53.7188	3	17.9063
8	AC	4.8802	2	2.4401
9	BC	126.9635	6	21.1606
10	AD	106.6563	7	15.2366
11	BD	833.5208	21	39.6915
12	CD	150.7552	14	10.7682
13	SB(A)	245.1563	6	40.8594
14	SC(A)	160.7708	4	40.1927
15	SD(A)	128.7813	14	9.1987
16	ABC	333.2031	6	55.5339
17	ABD	268.6979	21	12.7951
18	ACD	269.5781	14	19.2556
19	BCD	955.9948	42	22.7618
20	SBC(A)	287.5625	12	23.9635
21	SBD(A)	735.2604	42	17.5062
22	SCD(A)	423.5625	28	15.1272
23	ABCD	723.5052	42	17.2263
24	SBCD(A)	1823.7708	84	21.7116

Wire, Clear, Opaque versus Reunion

Social Contact

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	339.3776	1	339.3776
2	A	17.9401	1	17.9401
3	B	188.0911	3	62.6970
4	C	9.7708	2	4.8854
5	D	38.3516	7	5.4788
6	S(A)	44.2552	2	22.1276
7	AB	87.2786	3	29.0929
8	AC	14.1458	2	7.0729
9	BC	16.8542	6	2.8090
10	AD	81.7057	7	11.6722
11	BD	138.9297	21	6.6157
12	CD	80.4375	14	5.7455
13	SB(A)	79.7656	6	13.2943
14	SC(A)	49.8542	4	12.4635
15	SD(A)	52.7865	14	3.7705
16	ABC	28.4792	6	4.7465
17	ABD	90.4922	21	4.3092
18	ACD	28.3958	14	2.0283
19	BCD	189.9375	42	4.5223
20	SBC(A)	90.3125	12	7.5260
21	SBD(A)	173.3594	42	4.1276
22	SCD(A)	141.7292	28	5.0618
23	ABCD	192.3125	42	4.5789
24	SBCD(A)	302.4375	84	3.6004

Wire, Clear, Opaque versus Reunion

Social Play

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREFDOM	MEAN SQUARE
1	MEAN	12.3984	1	12.3984
2	A	.0026	1	.0026
3	B	20.0911	3	6.6970
4	C	.7656	2	.3828
5	D	7.4141	7	1.0592
6	S(A)	.9635	2	.4818
7	AB	2.1953	3	.7318
8	AC	4.9427	2	2.4714
9	BC	3.1510	6	.5252
10	AD	3.1432	7	.4490
11	BD	22.1797	21	1.0562
12	CD	7.7344	14	.5525
13	SB(A)	1.1406	6	.1901
14	SC(A)	.4583	4	.1146
15	SD(A)	8.8281	14	.6306
16	ABC	13.5156	6	2.2526
17	ABD	22.0755	21	1.0512
18	ACD	14.7240	14	1.0517
19	BCD	39.5156	42	.9408
20	SBC(A)	4.0000	12	.3333
21	SBD(A)	30.5677	42	.7278
22	SCD(A)	23.8750	28	.8527
23	ABCD	30.6510	42	.7298
24	SBCD(A)	66.6667	84	.7937

Wire, Clear, Opaque versus Reunion

Self Play

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	121.5000	1	121.5000
2	A	8.1667	1	8.1667
3	B	51.9375	3	17.3125
4	C	5.7344	2	2.8672
5	D	17.4583	7	2.4940
6	S(A)	116.0208	2	58.0104
7	AB	18.6875	3	6.2292
8	AC	16.3177	2	8.1589
9	BC	16.7656	6	2.7943
10	AD	22.8750	7	3.2679
11	BD	54.2708	21	2.5843
12	CD	21.1823	14	1.5130
13	SB(A)	73.5208	6	12.2535
14	SC(A)	17.9479	4	4.4870
15	SD(A)	42.8125	14	3.0580
16	ABC	23.1406	6	3.8568
17	ABD	54.1042	21	2.5764
18	ACD	26.2656	14	1.8761
19	BCD	122.1510	42	2.9084
20	SBC(A)	49.5104	12	4.1259
21	SBD(A)	111.3125	42	2.6503
22	SCD(A)	50.2187	28	1.7935
23	ABCD	120.4427	42	2.8677
24	SBCD(A)	233.6562	84	2.7816

Wire, Clear, Opaque versus Reunion

Social Groom

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	1899.2604	1	1899.2604
2	A	8.1667	1	8.1667
3	B	3694.5521	3	1231.5174
4	C	25.6302	2	12.8151
5	D	560.2396	7	80.0342
6	S(A)	47.7188	2	23.8594
7	AB	23.4792	3	7.8264
8	AC	12.9115	2	6.4557
9	BC	61.6823	6	10.2804
10	AD	32.6667	7	4.6667
11	BD	1931.6146	21	91.9816
12	CD	284.1198	14	20.2943
13	SB(A)	96.5729	6	16.0955
14	SC(A)	78.3125	4	19.5781
15	SD(A)	181.7813	14	12.9844
16	ABC	19.5677	6	3.2613
17	ABD	140.3542	21	6.6835
18	ACD	54.0052	14	3.8575
19	BCD	1465.9010	42	34.9024
20	SBC(A)	123.6458	12	10.3038
21	SBD(A)	585.5937	42	13.9427
22	SCD(A)	278.1875	28	9.9353
23	ABCD	241.8490	42	5.7583
24	SBCD(A)	716.1875	84	8.5260

Wire, Clear, Opaque versus Reunion

Self Groom

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	13078.3359	1	13078.3359
2	A	281.8776	1	281.8776
3	B	555.1536	3	185.0512
4	C	15.4375	2	7.7188
5	D	120.8099	7	17.2586
6	S(A)	162.6927	2	81.3464
7	AB	49.9453	3	16.6484
8	AC	28.8958	2	14.4479
9	BC	262.9792	6	43.8299
10	AD	349.4349	7	49.9193
11	BD	599.7839	21	28.5611
12	CD	467.4792	14	33.3914
13	SB(A)	223.7031	6	37.2839
14	SC(A)	124.9792	4	31.2448
15	SD(A)	373.7656	14	26.6975
16	ABC	331.6875	6	55.2812
17	ABD	462.4922	21	22.0234
18	ACD	153.6042	14	10.9717
19	BCD	644.2708	42	15.3398
20	SBC(A)	201.4375	12	16.7865
21	SBD(A)	799.0052	42	19.0239
22	SCD(A)	365.4375	28	13.0513
23	ABCD	490.3125	42	11.6741
24	SBCD(A)	1465.4792	84	17.4462

Wire, Clear, Opaque versus Reunion

Belly Present

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	9.0651	1	9.0651
2	A	.7526	1	.7526
3	B	7.2578	3	2.4193
4	C	.4115	2	.2057
5	D	4.5807	7	.6544
6	S(A)	.2760	2	.1380
7	AB	14.1536	3	4.7179
8	AC	3.9740	2	1.9870
9	BC	6.1719	6	1.0286
10	AD	3.2266	7	.4609
11	BD	11.0130	21	.5244
12	CD	9.5052	14	.6789
13	SB(A)	1.2031	6	.2005
14	SC(A)	.8021	4	.2005
15	SD(A)	6.5156	14	.4654
16	ABC	3.2760	6	.5460
17	ABD	12.4505	21	.5929
18	ACD	11.6094	14	.8292
19	BCD	33.7448	42	.8034
20	SBC(A)	6.2812	12	.5234
21	SBD(A)	25.8385	42	.6152
22	SCD(A)	18.0312	28	.6440
23	ABCD	28.3073	42	.6740
24	SBCD(A)	56.5521	84	.6732

Wire, Clear, Opaque versus Reunion

Social Sex

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	33.2526	1	33.2526
2	A	5.2734	1	5.2734
3	B	21.5078	3	7.1693
4	C	2.8958	2	1.4479
5	D	5.6849	7	.8121
6	S(A)	24.1302	2	12.0651
7	AB	2.4036	3	.8012
8	AC	1.9375	2	.9687
9	BC	11.1875	6	1.8646
10	AD	4.4974	7	.6425
11	BD	19.6380	21	.9351
12	CD	10.4792	14	.7485
13	SB(A)	10.5573	6	1.7595
14	SC(A)	2.7292	4	.6823
15	SD(A)	10.7448	14	.7675
16	ABC	13.8542	6	2.3090
17	ABD	23.2422	21	1.1068
18	ACD	11.3542	14	.8110
19	BCD	36.1042	42	.8596
20	SBC(A)	23.8958	12	1.9913
21	SBD(A)	37.4010	42	.8905
22	SCD(A)	15.2708	28	.5454
23	ABCD	31.1875	42	.7426
24	SBCD(A)	71.7708	84	.8544

Wire, Clear, Opaque versus Reunion

Self Sex

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	1.7604	1	1.7604
2	A	.2604	1	.2604
3	B	.8021	3	.2674
4	C	.9115	2	.4557
5	D	1.5729	7	.2247
6	S(A)	.5208	2	.2604
7	AB	2.1354	3	.7118
8	AC	.1615	2	.0807
9	BC	.7135	6	.1189
10	AD	2.0729	7	.2961
11	BD	4.1979	21	.1999
12	CD	4.7552	14	.3397
13	SB(A)	2.4375	6	.4063
14	SC(A)	.6979	4	.1745
15	SD(A)	2.1458	14	.1533
16	ABC	1.1302	6	.1884
17	ABD	3.8646	21	.1840
18	ACD	5.5052	14	.3932
19	BCD	10.2865	42	.2449
20	SBC(A)	1.2187	12	.1016
21	SBD(A)	11.5625	42	.2753
22	SCD(A)	4.6354	28	.1656
23	ABCD	9.8698	42	.2350
24	SBCD(A)	26.7812	84	.3188

Wire, Clear, Opaque versus Reunion

Vocalizations

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	4774.2604	1	4774.2604
2	A	4280.0104	1	4280.0104
3	B	61.1771	3	20.3924
4	C	50.9740	2	25.4870
5	D	49.4896	7	7.0699
6	S(A)	6080.3333	2	3040.1667
7	AB	92.5521	3	30.8507
8	AC	50.2552	2	25.1276
9	BC	47.8385	6	7.9731
10	AD	46.6563	7	6.6652
11	BD	192.4063	21	9.1622
12	CD	76.7760	14	5.4840
13	SB(A)	55.0000	6	9.1667
14	SC(A)	276.1042	4	69.0260
15	SD(A)	61.4167	14	4.3869
16	ABC	53.8073	6	8.9679
17	ABD	196.4479	21	9.3547
18	ACD	62.3281	14	4.4520
19	BCD	304.5781	42	7.2519
20	SBC(A)	47.1875	12	3.9323
21	SBD(A)	382.2500	42	9.1012
22	SCD(A)	146.3958	28	5.2284
23	ABCD	320.4427	42	7.6296
24	SBCD(A)	609.3125	84	7.2537

Play

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

SOURCE		SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	56.4063	1	56.4063
2	G	23.0563	1	23.0563
3	A	5.2563	1	5.2563
4	D	142.1063	19	7.4850
5	S(A)	4.7163	2	2.3563
6	GA	15.0063	1	15.0063
7	GD	144.8437	19	7.6233
8	AD	104.8437	19	8.6773
9	GS(A)	5.0125	2	2.5063
10	SD(A)	47.0313	38	1.2378
11	GAD	150.6187	19	7.9273
12	GSD(A)	52.7313	38	1.3877

Social Contact

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

SOURCE		SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	1550.0250	1	1550.0250
2	G	378.2250	1	378.2250
3	A	16.9000	1	16.9000
4	D	210.4750	19	11.0776
5	S(A)	15.1250	2	7.5625
6	GA	.4000	1	.4000
7	GD	270.2750	19	14.2250
8	AD	87.6500	19	4.6105
9	GS(A)	32.5250	2	16.2625
10	SD(A)	250.8750	38	6.6020
11	GAD	140.1000	19	7.3737
12	GSD(A)	256.4750	38	6.8283

Control versus Experimental

Social Groom

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	1097.2563	1	1097.2563
2	G	4.5563	1	4.5563
3	A	.3063	1	.3063
4	D	232.1188	19	12.2168
5	S(A)	29.7425	2	14.8713
6	G4	21.7563	1	21.7563
7	GD	247.8187	16	15.4886
8	AD	215.5687	19	11.3457
9	GS(A)	32.4125	2	16.2063
10	SD(A)	302.4875	38	8.4865
11	GAD	174.1187	19	9.1638
12	GS(A)	419.2375	34	12.3316

Belly Present

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	.0250	1	.0250
2	G	.0250	1	.0250
3	A	.4000	1	.4000
4	D	1.6250	19	.0855
5	S(A)	.0250	2	.0125
6	G4	.0000	1	.0000
7	GD	1.7250	19	.0908
8	AD	1.8500	19	.0974
9	GS(A)	.1250	2	.0625
10	SD(A)	2.4750	38	.0651
11	GAD	1.7500	19	.0921
12	GS(A)	3.3750	38	.0888

Social Sex

ANALYSIS OF VARIANCE FOR ITEM FOR VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	[illegible]	1	196.9000
2	G	16.9000	1	16.9000
3	A	.4000	1	.4000
4	D	99.8500	19	5.2553
5	S(A)	[illegible]	[illegible]	3.8250
6	GA	.1000	1	.1000
7	GD	[illegible]	19	6.0974
8	AD	47.3500	19	2.4921
9	GS(A)	19.8500	2	9.9250
10	SD(A)	122.8500	38	3.2329
11	GAD	[illegible]	19	3.2974
12	GS(A)	125.4500	38	3.3066

Agonistic Behavior

ANALYSIS OF VARIANCE FOR ITEM FOR VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	[illegible]	1	39.0063
2	G	6.8555	1	6.8063
3	A	2.7563	1	2.2563
4	D	[illegible]	19	2.4668
5	S(A)	[illegible]	[illegible]	4.3563
6	GA	[illegible]	1	10.5063
7	GD	[illegible]	19	2.6721
8	AD	[illegible]	19	3.3220
9	GS(A)	.1563	[illegible]	.0813
10	SD(A)	104.5375	38	2.7510
11	GAD	[illegible]	19	2.7036
12	GS(A)	[illegible]	38	2.9234

Control versus Experimental

Displacement

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	[illegible]	1	84,1000
2	G	84,1000	1	84,1000
3	A	15,0250	1	15,0250
4	D	35,1500	[illegible]	1,8500
5	S(A)	37,8000	[illegible]	13,9125
6	G'	[illegible]	1	15,6250
7	[illegible]	[illegible]	[illegible]	1,8500
8	AD	[illegible]	1	1,9539
9	GS(A)	37,1250	19	16,9125
10	SD(A)	37,8250	19	1,5572
11	GD	32,1750	1	1,9539
12	GSD(A)	29,5750	19	1,5572

Lipsmack

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	4,2250	1	4,2250
2	G	,4000	1	,4000
3	A	2,5000	1	2,5000
4	D	7,2750	19	,3829
5	S(A)	[illegible]	2	1,1125
6	GA	,0250	1	,0250
7	G'	[illegible]	19	,5579
8	AD	6,5000	19	,3421
9	GS(A)	,4250	2	,2125
10	SD(A)	17,2750	38	,4546
11	GD	[illegible]	19	,4937
12	GSD(A)	19,0750	38	,5020

Coo

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	2147.[illegible]417	1	2147.[illegible]417
2	S	.0000	2	.[illegible]
3	G	[illegible]39.5833	2	267.7917
4	R	153.5833	2	76.7917
5	D	1177.[illegible]583	7	168.2798
6	SG	[illegible].[illegible]000	4	[illegible].[illegible]
7	SR	-.0000	4	.0000
8	SD	560.6667	4	140.1667
9	GR	-.[illegible]000	14	-.0000
10	GD	824.4167	14	58.8869
11	RD	1114.4167	14	79.[illegible]12
12	SGR	-.0000	8	-.0000
13	SGD	-.[illegible]000	28	-.[illegible]
14	SRD	-.[illegible]000	28	-.[illegible]
15	GRD	[illegible]711.3333	28	[illegible].[illegible]76
16	SGRD	-.[illegible]000	56	-.0000

Bark/Grunt

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	450182.0417	1	450182.0417
2	S	.0000	2	.[illegible]
3	G	146956.5833	2	73478.2917
4	R	62366.3833	2	31183.6917
5	D	203116.2917	7	29016.1845
6	SG	-.0000	[illegible]	-.[illegible]
7	SR	-.[illegible]000	4	-.[illegible]
8	SD	36841.6667	4	9210.1667
9	GR	-.0000	14	-.0000
10	GD	115648.[illegible]833	14	8261.9774
11	RD	262626.5833	14	18773.3274
12	SGR	-.0000	8	-.0000
13	SGD	-.[illegible]000	28	-.[illegible]
14	SRD	-.[illegible]000	28	-.0000
15	GRD	279334.6667	28	[illegible]976.2381
16	SGRD	-.[illegible]000	56	-.0000

Cluck

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	6[illegible]19.1667	1	6[illegible].1667
2	S	.1111	1	.1111
3	C	37358.5833	2	18679.2917
4	P	16936.3333	2	8468.1667
5	D	20133.1667	2	10066.7381
6	SC	.1389	2	.0694
7	SP	.2222	4	.0556
8	CP	7[illegible]1.5667	4	1[illegible].1417
9	SD	-.0111	4	-.0028
10	CD	44346.2833	14	3167.5774
11	PD	38284.3333	14	2734.5952
12	SCP	-.0000	8	-.0000
13	SCD	-.1430	28	-.0051
14	SPD	-.1111	28	-.0040
15	CPD	24[illegible]3.5667	28	871.5595
16	SCPD	-.1111	56	-.0020

Screech

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	54.0000	1	54.0000
2	S	.0000	1	.0000
3	C	33.2500	2	16.6250
4	P	25.0000	2	12.5000
5	D	56.6667	2	28.3333
6	SC	-.0000	2	-.0000
7	SP	-.0000	4	-.0000
8	CP	26.5000	4	6.6250
9	SD	-.0000	4	-.0000
10	CD	140.0833	14	10.0060
11	PD	159.3333	14	11.3810
12	SCP	-.0000	8	-.0000
13	SCD	-.0000	28	-.0000
14	SPD	-.0000	28	-.0000
15	CPD	243.1667	28	8.6845
16	SCPD	-.0000	56	-.0000

Separation Vocalization Frequencies

Total

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE

SOURCE		SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	2259521.6667	1	2259521.6667
2	S	.0000	2	.0000
3	C	311825.5833	2	155912.7917
4	F	54966.7333	2	27483.1667
5	D	294441.3333	7	42063.0476
6	CF	-.0000	4	-.0000
7	SC	.0000	4	.0000
8	CD	19536.6667	4	4884.1667
9	SF	-.0000	14	-.0000
10	CD	190162.4167	14	13583.8869
11	FD	414681.6667	14	29614.4048
12	SCF	-.0000	8	-.0000
13	SCD	-.0000	28	-.0000
14	SFD	-.0000	28	-.0000
15	CFD	366333.3333	28	13083.3333
16	SCFD	-.0000	56	-.0000

Reunion Vocalization Frequencies

Coo

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	961.7778	1	961.7778
2	S	.0000	2	.0000
3	C	28.2222	2	14.1111
4	R	355.5556	2	177.7778
5	D	141.5556	2	70.7778
6	SC	-.0000	4	-.0000
7	SR	-.0000	4	-.0000
8	CR	126.4444	4	31.6111
9	SD	-.0000	4	-.0000
10	CD	312.4444	4	78.1111
11	RD	271.1111	4	67.7778
12	SCR	.0000	8	.0000
13	SCD	-.0000	8	-.0000
14	SRD	-.0000	8	-.0000
15	CRD	410.8889	8	51.3611
16	SCRD	-.0000	16	-.0000

Bark/Grunt

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	181760.1111	1	181760.1111
2	S	.0000	2	.0000
3	C	15192.5889	2	7596.4444
4	R	1146.8889	2	573.4444
5	D	11926.2222	2	5963.1111
6	SC	-.0000	4	-.0000
7	SR	-.0000	4	-.0000
8	CR	30483.1111	4	7620.7778
9	SD	-.0000	4	-.0000
10	CD	17473.7778	4	4368.4444
11	RD	28911.7778	4	7227.9444
12	SCR	-.0000	8	-.0000
13	SCD	-.0000	8	-.0000
14	SRD	-.0000	8	-.0000
15	CRD	52193.2222	8	6524.7778
16	SCRD	-.0000	16	-.0000

Reunion Vocalization Frequencies

Cluck

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	273192.4444	1	273192.4444
2	S	.0000	2	.0000
3	C	48.2222	2	24.1111
4	R	6887.8889	2	3443.9444
5	D	5053.5556	2	2526.7778
6	SC	-.0000	4	-.0000
7	SR	-.0000	4	-.0000
8	CR	15673.4444	4	3918.3611
9	SD	-.0000	4	-.0000
10	CD	5137.7778	4	1284.4444
11	RD	12990.1111	4	3247.7778
12	SCR	-.0000	8	-.0000
13	SCD	-.0000	8	-.0000
14	SRD	-.0000	8	-.0000
15	CRD	10503.9556	8	1312.9944
16	SCRD	-.0000	16	-.0000

Screech

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	544.4444	1	544.4444
2	S	.0000	2	.0000
3	C	150.8889	2	75.4444
4	R	713.5556	2	356.7778
5	D	296.2222	2	148.1111
6	SC	-.0000	4	-.0000
7	SR	-.0000	4	-.0000
8	CR	649.1111	4	162.2778
9	SD	-.0000	4	-.0000
10	CD	358.4444	4	89.6111
11	RD	579.7778	4	144.9444
12	SCR	.0000	8	.0000
13	SCD	-.0000	8	-.0000
14	SRD	-.0000	8	-.0000
15	CRD	573.5556	8	71.9444
16	SCRD	.0000	16	.0000

Total

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	1[illegible]3+5.7778	1	1[illegible]7346.7778
2	S	.0000	2	.0000
3	C	12630.3333	2	9303.4444
4	[illegible]	3197.5556	2	1598.7778
5	D	35496.2222	2	17748.1111
6	SC	-.0000	4	-.0000
7	[illegible]	-.0000	4	-.0000
8	CP	29[illegible]5.7778	4	7376.4444
9	SI	-.0000	4	-.0000
10	CD	43451.1111	4	10862.7778
11	[illegible]	79537.[illegible]	4	19[illegible].0111
12	[illegible]	.0000	8	.0000
13	[illegible]	.0000	8	.0000
14	[illegible]	.0000	8	.0000
15	CPD	58634.2222	8	7[illegible].7778
16	SCPD	-.0000	16	-.0000

Coo

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	2945.2813	1	2945.2813
2	S	.0000	2	.0000
3	C	537.3438	3	179.1146
4	R	80.6875	2	40.3438
5	D	1554.4688	7	222.0670
6	SC	-.0000	6	-.0000
7	SR	-.0000	4	-.0000
8	CR	625.9125	6	104.3021
9	SD	-.0000	14	-.0000
10	CD	1179.9063	21	56.1860
11	RD	655.3125	14	46.8080
12	SCR	-.0000	12	-.0000
13	SCD	-.0000	42	-.0000
14	SRD	-.0000	28	-.0000
15	CRD	3620.1875	42	86.1949
16	SCRD	-.0000	84	-.0000

Bark/Grunt

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	605000.0000	1	605000.0000
2	S	.0000	2	.0000
3	C	146973.7500	3	48992.9167
4	R	26851.1875	2	13425.5938
5	D	204142.0000	7	29163.1429
6	SC	-.0000	6	-.0000
7	SR	-.0000	4	-.0000
8	CR	86261.3125	6	14376.8854
9	SD	-.0000	14	-.0000
10	CD	152633.2500	21	7268.2500
11	RD	191628.3125	14	13687.7366
12	SCR	-.0000	12	-.0000
13	SCD	-.0000	42	-.0000
14	SRD	-.0000	28	-.0000
15	CRD	431247.1875	42	10267.7902
16	SCRD	-.0000	84	-.0000

Wire, Clear, Opaque versus Reunion Vocalization Frequencies

Cluck

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	826898.0000	1	826898.0000
2	S	.0000	2	.0000
3	C	37691.2500	3	12560.4167
4	P	15381.0625	2	7690.5313
5	D	26444.0000	7	3777.7143
6	SC	-.0000	6	-.0000
7	SR	-.0000	4	-.0000
8	CP	9563.6875	6	1593.9479
9	SD	-.0000	14	-.0000
10	CD	61134.7500	21	2911.1786
11	PD	48022.9375	14	3430.2098
12	SCP	-.0000	12	-.0000
13	SCD	-.0000	42	-.0000
14	SPD	-.0000	28	-.0000
15	CPD	37108.3125	42	883.5312
16	SCPD	-.0000	84	-.0000

Screech

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	338.0000	1	338.0000
2	S	.0000	2	.0000
3	C	327.2500	3	109.0833
4	P	38.6875	2	19.3438
5	D	525.5000	7	75.0714
6	SC	-.0000	6	-.0000
7	SR	-.0000	4	-.0000
8	CP	205.0625	6	34.1771
9	SD	-.0000	14	-.0000
10	CD	1223.2500	21	58.2500
11	PD	603.8125	14	43.1295
12	SCP	-.0000	12	-.0000
13	SCD	-.0000	42	-.0000
14	SPD	-.0000	28	-.0000
15	CPD	1436.4375	42	34.2009
16	SCPD	.0000	84	.0000

Wire, Clear, Opaque versus Reunion Vocalization Frequencies

Total

ANALYSIS OF VARIANCE FOR DEPENDENT VARIABLE 1

	SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE
1	MEAN	3096939.2813	1	3096938.2813
2	S	.0000	2	.0000
3	C	313568.0938	3	104522.6979
4	P	32643.8125	2	16321.9063
5	D	381571.4688	7	54510.2098
6	SC	-.0000	6	-.0000
7	SP	-.0000	4	-.0000
8	CP	66424.9375	6	11070.8229
9	SD	-.0000	14	-.0000
10	CD	210085.1563	21	10004.0551
11	PD	33572.6875	14	2398.3348
12	SCP	-.0000	12	-.0000
13	SCD	-.0000	42	-.0000
14	SPD	-.0000	28	-.0000
15	CPD	531508.5625	42	12654.9658
16	SCPD	-.0000	84	-.0000