Psychological Wellness for Captive Chimpanzees: An Evaluative Program

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Authors describe the "Wellness Program" of the Primate Foundation of Arizona (PFA) devoted to producing physically and behaviorally normal chimpanzees. Psychological well-being is a major focus.

In this paper, the authors present protocols specific to the provision of stimulation enrichment, a description of techniques utilized, evaluation procedures for both the protocol and individual assessment of well-being, and staff and training guidelines. The protocols are applicable for both large and small facilities.

KEY WORD INDEX: chimpanzee, husbandry, animal welfare, animal housing, animal technicians, educational methods

INTRODUCTION

The Primate Foundation of Arizona (PFA) has always regarded the physical and psychological wellness of the chimpanzees in their care as paramount to the program (Fritz, 1974, 1975, 1976). The creed of the organization, which was incorporated in 1970, is: "Devoted to the preservation, propagation, and study of the chimpanzee (Pan troglodytes)." The PFA Policy Statement, ratified on November 17, 1979, and still in effect today, contains an Animal Welfare Policy. Within that Policy, Article 2.3 states: "The foremost consideration of the Foundation will always be the health and welfare of the chimpanzee (Genus pan)." Article 2.8 states: "The Foundation will comply with, to the best of its ability, all animal welfare regulations in effect at any time." The term chimpanzee "caregiver" was developed in a workshop held at PFA in 1981. The term has been consistently used since that time and has been adopted for use by other institutions and behavioral investigators.

The primary concern of the Primate Foundation of Arizona (PFA) is to maintain a chimpanzee breeding colony (Pan troglodytes) that will produce further generations of breeding animals. To accomplish this, the colony is managed to assure the maintenance and production of chimpanzees that are physically healthy and behaviorally normal, i.e., behaviors that equate to wild chimpanzee behaviors. Animal health is maintained by a Staff Veterinarian and a qualified, well trained care staff. The colony totals 78 individuals, which include 46 females, ranging in age from two years to 39 years, and 32 males, ranging in age from three months to 26 years. The age categories used at PFA are: Neonate-birth through 30 days: Infant-31 days through 12 months: Kindergarten-13 through 47 months (one to four yrs.): Juvenile-48 through 83 months (four to seven yrs.); Adolescent-84 through 107 months (seven to nine yrs.); Adult (young)-108 through 179 months (nine to 15 yrs.); Adult (prime)-180 through 239 months (15 to 20 yrs.): Adults (mature)-240 through 359 months (20 to 30 yrs.); and Adults (old)-360 months to death (30 yrs.+). The psychological well-being of each of these individuals is assured by close observation and the compassionate, knowledgeable care provided. Development of young animals is closely monitored. Daily behavioral observations are conducted by research staff trained to recognize normal and abnormal chimpanzee behaviors. Comprehensive records of individual's health, reproductive status, genetics, and behavior facilitate management decision-making.

To expand upon the above creed and Policy Statement, PFA initiated a Wellness Program. The Program also complies with the U.S.D.A Animal Welfare Act requirement for assuring the psychological well-being of primates. Although the U.S.DA. does not define "psychological well-being," it is generally agreed that it includes providing an environment that would encourage species-specific behaviors, such as social and locomotor behaviors. The PFA Wellness Program includes protocols specific to the provision of enrichment by social and non-social stimulation, a description of techniques utilized, evaluation procedures for both the protocol and individual assessment of well-being, and staff training guidelines. The PFA Program is presented here as a pragmatic example of a program that monitors the wellness of each individual in a colony of over 70 chimpanzees.

Except for brief periods, due to illness, injury or a temporary social incompatibility, all chimpanzees at PFA are maintained in compatible, conspecific social groups. This provides the time necessary for species-typical activities, and the opportunity for social interaction and learning (Fritz, 1971; Fritz & Fritz, 1979; Reinhardt et al., 1987; Westergaard & Fragaszy, 1985). A variety of non-social enrichment techniques are also utilized, many of which have been found to alleviate boredom, encourage species-typical activities, and to reduce time spent in abnormal behaviors, thus assuring psychological wellness (Bayne, 1989; Chamove et al., 1973; Kraemer & McKinney,1979; Simpson,1984; Novak & Suomi, 1988; Novak & Drewson, 1989). The Wellness Program is systematically improved and updated as rapidly as the new information becomes available.

PROVIDE SOCIAL CONTACT

The social group housing is an important component of PFA's Wellness Program. Wild chimpanzees live in social groups, typically multi-male, bi-sexual communities, or "unit groups" (Goodall, 1968). Smaller sub-groups are temporarily associated, usually consisting of less than six members (Gombe: Goodall, 1968; Budongo: Reynolds & Reynolds, 1965; Mahale: Nishida, 1974). At PFA, chimpanzees are housed in compatible social groups (sub-groups) comprised of two to eight animals. Compatibility is achieved by careful attention to each individual and his or her preference for or dislike of companions of both sexes (Fritz & Fritz, 1979; Fritz & Nash, 1983), either of which may require an individual's movement to another social group. Fritz and Fritz (1979) observed that the "social role or individual behavior as related to the group is established almost immediately upon formation of the artificial group. The relationships are then permanently resolved within that group. The group, if allowed to remain together, may become socially limited." Group composition is also changed periodically to more closely resemble the fission-fusion movements in the wild. The housing design (Figure 1) allows for these fluctuating group associations and ease of shifting individuals (Fritz, 1986; Fritz & Nash, 1983).

Fritz and Fritz (1979) established guidelines for captive chimpanzee group sociality that are still used today: "Compatibility (absence of severe aggression) among members of the group is achieved by the appropriate selection of individuals." They went on to state that it should be emphasized, that avoidance, apathy, and lack of interaction in a group may give the appearance of group compatibility. In that case, compatibility is the absence of sociability. They established a Socialization Index that was utilized in the process of rehabilitation of many of the chimpanzees. This Socialization Index remains applicable to determining an individual's interactions with members of his or her group. The four steps in an abbreviated form are: 1) interaction; 2) initiating tactile contact and demonstrating increased frequency in the number of contacts; 3) initiating interaction with all members of a selected group, which may include aggression; and 4) ability to move from group to group with positive interaction; initiating and receiving all socially acceptable behaviors; ability to assume different roles in different groups. Thus, lack of interaction and overt aggression could indicate "dislike" of an individual or individuals in the group. Positive interaction, i.e., grooming, playing, etc. would indicate preference.

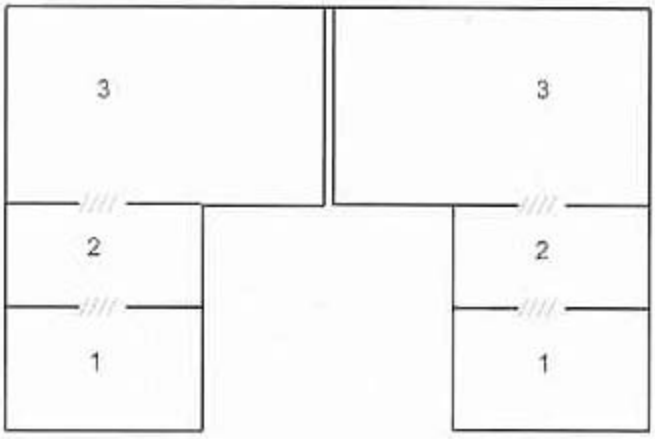

Figure 1. Bay Diagram. Groups are typically provided three interlocking cages (1,2,3) and two groups are housed within a Bay.

Expanding the social contact within the complex of three (3) interconnecting cages (1/2bay) is achieved by the olfactory, visual, auditory , and tactile (OVAT) stimuli (Fritz & Fritz, 1979, 1982) that is available by cage design. Two groups are housed in a "full bay". In addition, the outdoor rotation schedule is flexible and provides change of groups that have OVA (limited tactile) contact.

Indoor housing

In the wild, sexual relations are promiscuous, although courtships do occur (Goodall 1986). Females display a regular monthly menstrual cycle (41.8 days) with periodic swelling and deturgescence of the ano-genital region (Goodall, 1968). Both males and females initiate copulations. Mother/offspring association is long term, lasting for several years past weaning (3.5-4.5 yrs) (Gombe: Goodall, 1968; Pusey, 1983). PFA social groups are "designed" to allow for the development and continuance of sexual relationships and constant mother-infant contact.

Changes to the conspecific social group composition allow "promiscuous" behavior, although strict records are maintained with regard to genetics and group changes to take all familial relations into consideration. Female cycle charts and male copulation records are maintained (see Harr, 1989, for complete description). Lack of reproductive behavior signals a need for change in group composition and/or increased opportunity for reproductive behavior (Fritz & Fritz, 1979; Nash & Fritz, 1982).

Mother-infant pairs are not separated during infancy (except in emergencies), allowing normal social contact between mother and infant from birth to adolescence. For infants who must be hand-reared, intensive hand-rearing practices are utilized (detailed in Fritz & Fritz, 1982, 1985). For example, infants receive 24 hour attention by a primary caregiver, are usually carried in a ventro-ventral position much of the 24 hour day, and are provided food on demand.

Last, the Program allows pregnant females time to be non-social, if they so desire. In the wild, females may go off by themselves during the final days of pregnancy, minimizing possible stressful social interactions (Goodall, 1968). Based on this finding, females in the last weeks of pregnancy may be housed singly, but adjacent to the social group. This allows for social contact (OVAT) without strenuous or disturbing activities.

PROVIDE FOR OCCUPATION AND EXERCISE

Wild chimpanzees spend eight to 20 percent of their day travelling (Gombe: Wrangham, 1977). Males travel further daily than do females; and cycling females travel further daily than do anestrous mothers, and females during late stages of pregnancy, or females within the first few weeks after giving birth (Gombe: Wrangham, 1975). PFA provides space that exceeds current guidelines (National Research Council, 1985). This allows area for travel, exercise, and play. Nesting materials consisting of shredded paper, straw, branches, and palm fronds are provided.

MEASUREMENTS OF THE PFA CHIMPANZEE HOUSING FACILITIES

DESCRIPTION	LENGTH	WIDTH	HEIGHT	SQUARE FEET	TOTAL BAY	TOTAL LEVEL SQUARE FEET
Upper Indoor Caging						
Bay #U1 (1/2 Bay)	6.25 6.25 10.83	6.33 6.33 10.08	9.08 9.08 9.08	39.56 39.56 109.17	188.29	
Bay #U2	6.08 6.08 10.91 6.08 6.08 10.91	6.33 6.33 10 6.33 6.33 10	9.08 9.08 9.08 9.08 9.08 9.08	38.49 38.49 109.1 38.49 38.49 109.1	372.15	
Bay #U3	Same as #U2				372.15	
Bay #U4	Same as #U2				372.15	1304.74
Lower Indoor Caging						

DESCRIPTION	LENGTH	WIDTH	HEIGHT	SQUARE FEET	TOTAL BAY	TOTAL LEVEL SQUARE FEET
Bay #D1	6.33 6.33 14.33 6.33 6.33 14.33	6.33 6.33 10 6.33 6.33 10	9.5 9.5 9.5 9.5 9.5 9.5	40.07 40.07 143.3 40.07 40.07 143.3	446.88	
Bay #D2	Same as #D1				446.88	
Bay #D3 (1/2 Bay)	6.33 6.33 14.16	6.33 6.33 12.16	9.5 9.5 9.5	40.07 40.07 172.19	252.32	1143.08
Upper Outdoor Caging (right to left)						
1 2 3 4	22.41 22.41 22.41 22.41	21.66 21.66 21.66 10	16 16 16 16	485.4 485.4 485.4 224.1	1680.3	
Lower Outdoor Caging (right to left)						
1 2 3	40.4 40.4 48	20.4 20.4 8	20.7 20.7 14	824.16 824.16 384	2032.32	3712.62

Access to outdoor exercise areas is provided to all but a small number of animals every other week. Three indoor cages temporarily house animals that must be maintained separately due to illness, injury, etc. These animals have no access to the outside. However, those areas are provided additional devices within the enclosures, e.g.. tire swings and fire hose "vines." Broad spectrum lighting and skylights are included in this area to promote visual enrichment by supplying a more "natural" light source (Mayron et al., 1974). In addition, as this area is slightly away from the general colony noise, increased auditory stimulation is provided by soft background music (radio). The radio is controlled by the care staff and while there is no hard evidence that it is appreciated by the chimpanzees, it is the general consensus of the care staff that the animals appear to be less nervous when the music is on. This area is generally considered to be temporary housing and animals housed there are rotated out as rapidly as is feasible.

The outdoor rotation assists in increasing locomotor activity and alleviates boredom (figure 4). The "every other week" schedule has been very successful in maintaining the novelty of the outdoor area. During this rotation, the door separating the indoor/outdoor area is left open to increase travel distance and to allow the chimpanzees the opportunity for choice of

habitation/occupation area. Chimpanzees on the indoor rotation week lack "travel" access to the outdoor area. However, they are provided with additional forage, browse, and "toys" for occupation.

Outdoor play cages

Wild chimpanzees spend 50 -80% of the day above the ground (Goodall, 1968; Reynolds & Reynolds, 1965). In addition, night nests are constructed 15 feet above ground (range= 1 5-80 ft.) (Goodall, 1968). Based upon this finding, PFA enclosures have been designed with increased vertical height to simulate the height of trees in Africa and to provide opportunity for locomotion above ground. Indoor housing areas are ten feet high and outdoor areas are 16 to 20 feet high. Resting benches within these areas are a minimum of five feet above the floor indoors, with some as high as 22 feet in the outdoor areas. In a study of mother /infant pairs, Goff and Nankivell (1990) found adult females and infants had significant preferences for higher vertical levels. Likewise, Traylor-Holler and Fritz (1985) found adults most often used locations above ground level.

In the wild, adult chimpanzees construct both "night" nests for sleeping, and "day" nests for resting (Gombe: Goodall, 1986; Wrangham, 1977). Infants between 2.5 and five years make nests more frequently during the day, compared to their mothers and elder siblings. In addition, these infants sometimes play in nests during the day (Goodall, 1968). At PFA, bedding (straw or shredded paper) is provided throughout the day for nest building occupation. Palm fronds, cardboard boxes, and plastic washtubs/crates are also supplied frequently, which increases nest building activities.

Adult chimpanzees rest during the day in the wild, typically between 9:30 a.m. and 3:00 p.m., for at least two hours. Day nests are constructed and animals spend time sleeping, reclining idly, and grooming themselves or each other during resting periods (Goodall, 1968). At PFA, adult chimpanzees also rest during the day, although resting occurs most often in the afternoon hours (12:00 p.m. to 3:00 p.m.). Management routines, such as cleaning and immobilizations for health checks, are accomplished in the morning to allow the remainder of the day to be undisturbed - the chimpanzees may "do as they please" or simply rest.

Wild chimpanzees spend time in social play, solitary play, and object play (Goodall, 1968). At PFA, social groups allow for social play activities. Increased cage size and outdoor exercise areas provide space sufficient for both social and solitary play (Matevia et al., 1991; Howell & Fritz, 1990; Menkhus & Fritz, 1986). In addition, devices are provided that can be easily

manipulated (Shefferly, 1988). These "toys" are changed on a regular basis to increase stimulative effects and exploratory/play behavior. They may include both destructible and indestructible toys (e.g., traffic cones, crates, cardboard boxes, newspaper, shredded office paper, plastic milk jugs, plastic bottles) (Figure 5).

Indoor enrichment

In the wild, chimpanzees spend 46 to 60 percent of their day feeding, and are omnivorous, consuming predominately fruit (56-71%), leaves/bark/stems (18-28 %), and other, including meat (4-23 %) (Gombe: Goodall, 1986; Wrangham, 1977; Gabon: Hladik, 1977). A majority of foods are seasonably available, and thus eaten only at certain times of the year (Gombe: Goodall, 1986). At PFA, the diet and feeding regimen is also considered to be a part of the Wellness Program. The omnivorous diet includes seasonal fruits, vegetables, and a commercial monkey chow. Feeding is three times daily to provide increased feeding occupation (for effects on behavior see Howell et al. 1992). Fruits and vegetables are given whole to increase time spent in feeding occupation, and the pits and skins provide wadge material. In addition, forage (e.g., chicken scratch, sweet feed, air-popped popcorn) or browse (leaves, branches) are broadcast daily in bedding (straw or shredded paper) to increase time spent in forage activity (Grief et al., 1992). Food intake and nursing frequency is closely monitored for young infants (for dietary guidelines see Fritz et al., 1985; Fritz et al., 1988).

REMAIN SENSITIVE TO INDIVIDUAL NEEDS

Provision of psychological wellness is a process that must be overseen from birth (a historic perspective) and continued on a day-to-day basis by daily monitoring. As such, PFA guidelines for psychological wellness are particularly sensitive to the animal's history and his or her individual needs (Fritz, 1986; Sackett, 1991; Suomi & Novak, 1991). In addition to provisions discussed above, each staff member frequently speaks to each animal throughout the day. Care staff administer oral vitamins through a straw to each older infant, juvenile, and adult. This allows time for additional "conversation" as well as close examination of the individual. While neither of these procedures allows tactile or physical contact between caregivers and animals, visual and auditory interactions are provided.

A psychological wellness behavioral history record that is sensitive to past social and non-social experience (Fritz, 1986; Fritz et al., 1989; Suomi & Novak, 1991) is maintained for each animal. The form is divided into four parts: social experience, non-social experience, abnormal behavior records, and individual sociality/coping assessment history (Figure 6). Abnormal behaviors, for the purpose of this history, are defined as those behaviors that may interfere with either psychological or physical wellness. The social experience portion documents the rearing history of the individual. Negative physical or social experience is a broad category of actions/events that might impact normal social development. The non-social

experience portion of the form provides housing information, including housing in enriched and non-enriched situations. Enriched environments are those that follow comparable PFA protocols, including encouragement of species-typical activities, and sensitivity to individual need. Non-enriched environments are those that are not conducive to species-typical activity and may include little sensitivity to individual need.

PFA caregivers and research staff are familiar with the social structure of chimpanzees in the wild and with their behavior in captivity. They are also intimately aware of and able to recognize individual behavior patterns. This includes stereotypies and what may cause stress to the individual, as well as the individual's preference for particular caregivers, games, occupational devices, food, etc. This individual awareness, this responsiveness, is part of the caregiver training. 'Know thy chimpanzee!' is a PFA mandate.

Any abnormal behavior is documented, including the date it was first seen, its frequency, its situation association, and if applicable, the date it was eliminated from the animal's behavioral repertoire.

Abnormal behaviors include, but are not limited to, gluttony for food/water, rocking (non-responsive), coprophagy, urophagy, regurgitation, self-mutilation, self-clinging, self-aggression, and aggression or fear that exceeds what would be considered a normal reaction to the specific situation, and any other adverse action or reaction that may be related to stress.

In addition to the behavioral history record, an animal profile record is written by the caregivers for each animal in the colony (Figure 7). This description provides additional information on the personality traits of individuals in the colony, which assists in the assessment of individual wellness. Individual reactions to people or situations are included. Any peculiar behaviors, normal aggression levels, and other potentially important information about the individual are outlined.

The evaluation of the daily assessments, recorded on the PFA Monthly Psychological Wellness Assessment Record, "Positive" section (discussed below) provides the individual's sociality and coping skills at age intervals and his or her current status.

Attributes relative to psychological wellness are monitored daily for all animals six months of age and older on the PFA Monthly Psychological Wellness Assessment Record (Figure 8). These include participation in species-typical "positive" activities, ability to cope in a social group and interact with others, and, if applicable, participation in non-typical "abnormal" activities (Figure 6). Although research at PFA indicates that presence of abnormal behaviors has little effect on parenting skills, increased time spent in abnormal activities may signal either physical or psychological distress (Alford et al., 1986; Fritz, 1986; Fritz & Fritz, 1979; Fritz et al., 1988; Fritz et al., 1989). The psychological wellness of infants under six months of age is assured by closely monitoring the mother and her parenting skills.

Negative changes in psychological wellness are immediately discussed with the Staff Veterinarian, Colony Director, and Director, followed by appropriate action. Changes in the Colony Protocol, e.g., the addition of new devices, techniques, or conspecific social group changes, are considered whenever animals exhibit new abnormal behaviors (Fritz & Fritz, 1988). Further, varied social and non-social techniques are used whenever animals interact ineffectually, i.e., do not participate in social activities, or have trouble coping with others in their social group (for a description of techniques see Fritz & Fritz, 1979).

The Monthly Assessment record is easily altered for particular animals. Some of the behaviors may not be applicable to certain individuals. However, the scale at the bottom of the page is never adjusted for more than three behaviors (e.g., the "Excellent" score is always seven or better). Low monthly scores help to identify animals at risk. Multiple daily observations are made by all staff, including the Staff Veterinarian and the Colony Director. This provides information needed to identify both the problem and possible solutions. Immediate steps are taken by the Veterinarian/Colony Director to rectify the problem. We have found that a sudden decline in monthly scores may also provide early warning of illness, with no other outward clinical signs. A slower decline in monthly scores may also be due to illness, but is more frequently due to increased time spent in abnormal behavioral patterns.

A monthly summary report memorandum is prepared and circulated to the staff. It includes a listing of animals who scored "lowest" and any additional information that may be helpful toward assurance of that individual's wellness. Scores that show improvement over the prior month are also noted with praise given to the staff. That provides important positive reinforcement.

PROVIDE EMPLOYEE TRAINING

PFA caregivers are trained in chimpanzee behavior and vocalizations. Trained staff, assisted by the Research Department, are responsible to provide new caregivers with the training materials and, when in the colony, to note vocalizations and their meaning. Initial psychological wellness training includes getting to know each individual by name, as well as learning about their backgrounds, particular needs, and special preferences. The initial training period of six months is accompanied by training in chimpanzee behavior. Books and reprints are available within an extensive library that is dedicated to chimpanzee behavior and management. Following the initial six-month training period, the new caregiver is given a written test on the basics of chimpanzee behavior and vocalizations. This test is repeated annually. We ask nine questions. Possible answers are included in parentheses.

a) How do you know a chimpanzee is exhibiting aggression? What are the accompanying vocalizations/gestures? (Bipedal swagger, Branch drag, Charging display, Flapping)
b) How do you know a chimpanzee is exhibiting fear? What are the accompanying vocalizations/gestures? (Avoidance, "Boo" bark, Crouch, Fear grin, Flee/flight)
c) How do you know a chimpanzee is frustrated? What are the accompanying vocalizations/gestures? (Horizontal pout face, nervous scratching, rocking (maybe), whining, temper tantrums)
d) Describe "happy" vocalizations. (Food barks, pleasure panting, lip smacking)
e) Describe a situation whereby a chimpanzee would use the vocalization "pant hoot" (Communication between groups or during feeding excitement)
f) How do you know a chimpanzee is unhappy? (Changes in normal behavior that may include: inattentive, withdrawn, refuses food, non-social, no play)
g) Describe a situation whereby a chimpanzee would use the vocalization "wraah." (The "wraah" vocalization is intended to carry great distances to announce to others that something dangerous or unknown, thus dangerous, is happening. Any description containing this information, i.e., smoke, a snake, etc. would indicate understanding of this vocalization)
h) Why do we provide environmental enrichment for chimpanzees in our care? (Environmental enrichment is provided to elicit species-typical behavior and to diminish boredom and/or stereotypies. Chimpanzees are extremely intelligent animals and without occupation they become bored. It is part of the ethical treatment of animals to provide housing that enriches their physical, mental, and social wellness. Any answer addressing these issues would be correct.)

i) How can you, as an employee, provide for psychological wellness of chimpanzees in your care? (Follow the PFA Wellness Program. Understand chimpanzee behavior, thus be an enlightened caregiver who can report changes in the animals' actions or specific needs of the individual animal. Provide daily attention to each individual. Think of new enrichment procedures. Addressing any of these would be a correct answer.)

Answers to these questions are qualitatively assessed for accuracy and completeness. If accurate answers are not provided, correct answers and a discussion of each answer are provided by the supervisory staff. Also, if the first tests contain any inaccurate information, a follow-up test (same test) is taken after another 30 days. Following successful completion of the test and six months of continuous employment, caregivers are permitted to score the positive and negative (abnormal) behaviors included in the Monthly Psychological Wellness Assessment. This six month training period and the written tests assure that each caregiver and research staff member is well versed in chimpanzee behavior, including vocalizations. Results of all training and tests are permanently maintained in personnel files.

EVALUATE THE PROGRAM

At each bi-annual Institutional Animal Care and Use Committee (IACUC) meeting, modifications/additions are detailed, discussed, and need for any change or action is reported to the Institutional Official. The Program and environmental enrichment devices are, evaluated annually by each trained staff member. A summary of this annual evaluation is prepared and presented to the IACUC as well as returned to all staff members for their information and action. The annual evaluation questions are purposefully general, and provide the staff the opportunity to participate in maintaining and improving the Wellness Program. Careful attention to carestaff suggestions is an important component of the Program. The evaluation includes the following questions:

a) Did PFA provide relevant information for you that was specific to environmental enrichment?
b) In your opinion, has sufficient social enrichment been provided for each animal in the colony?
c) Has sufficient non-social enrichment been provided for each in the colony?
d) List at least five ways PFA could improve the psychological wellness of the animals in our care.
f) List any negative drawbacks of devices/techniques currently in use. Please provide explicit examples.

SUMMARY

The PFA Psychological Wellness Program provides assurance and documentation of the behavioral health of the chimpanzees. The first step requires a qualified and well trained staff. They then provide consistent, accurate documentation and evaluation of individual animals. Acknowledging the findings and implementing the necessary changes for individual animals are the final steps of the process. The Program and its processes can be easily adapted for use in chimpanzee colonies, zoological gardens, and research facilities.

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