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S. Carlson

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# DOUBLE-BLIND TEST OF ASTROLOGY

Shawn Carlson*

Nuclear Science Division
Lawrence Berkeley Laboratory
University of California
Berkeley, California 94720

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*present address: Dept. of Physics, University of California, Los Angeles, CA 90024

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Shawn Carlson*

University of California
Berkeley California 94720

## ABSTRACT

Two double blind tests were made of the thesis that astrological "natal charts" could be used to describe accurately personality traits of test subjects. In the first test, we attempted to determine whether a person could recognize his own personality when described by an astrologer through a "natal chart interpretation". In the second test, we attempted to determine whether astrologers could correctly match a person's natal chart to the results of a well known and scientifically accepted personality test (the California Personality Inventory or CPI). Care was taken to make sure that the procedures satisified both scientists and astrologers. Subjects' recognition of their own natal chart interpretations was poor, but we draw no conclusion from this first test because the same subjects failed to recognize their own CPI profiles as well. The abilities of astrologers to match natal charts to CPIs was not significantly different from that predicted by the "scientific" hypothesis (i.e. their choices were no better than random), a result which strongly refutes the astrological thesis.

## INTRODUCTION

Although there have been many published "tests" of astrology, those with positive results (confirming the astrologers' theses) have been largely dismissed by scientists due to poor scientific technique. Those with negative results (disputing the astrologers' theses) have been largely dismissed by astrologers for their failure to test what the astrologers considered to be the reliable and fundamental aspects of their work. Astrologers complain that most scientific tests have tested the scientist's concept of astrology, rather than astrology as practiced by the "reputable" astrological community. Without committing ourselves to either point of view, we believe that both criticisms are valid.

*Present address: Dept. of Physics, University of California, Los Angeles, California 90024.

The purpose of this experiment was to overcome the criticisms of the previous tests by designing an experiment that would meet the tight specifications of both the scientific and astrological communities. Such an experiment was designed with the help of scientists, statisticians, and astrologers. We decided to test what we shall call (for simplicity) the "fundamental thesis of natal astrology" as the proposition that

> The positions of the 'planets' (all planets, the sun and moon, plus other objects defined by astrologers) at the moment of birth can be used to determine the subject's general personality traits and tendencies in temperament and behavior, and to indicate the major issues with which one is likely to contend.

In order to satisfy both the scientific and astrological communities, we decided to choose as advisors people held in high esteem by their respective communities. (Many scientists are surprised to discover that not all astrologers are held in equal esteem by their peers, although they certainly know that the scientists most well known to the public are often not the ones they respect the most.) The astrologers helped us to formulate the fundamental "thesis" given above as central to "natal astrology" (the subfield of astrology which deals with birth data) and yet scientifically testable[1].

While designing the experiment, great pains were taken to include all suggestions made by the astrologers as long as those suggestions could be implemented without biasing the experiment for or against the astrological thesis. We took great care to eliminate all biases which could tend to "randomize" the results and thus favor the scientific hypothesis over the astrological one. Similar care was taken to make sure that hidden clues were not available which could be used by astrologers or subjects to chose correct answers not based on astrological information alone.

The device used by astrologers to make their predictions is called a "horoscope". A horoscope is in essence a picture showing the positions of the various astrological objects in the heavens on a backdrop of 12 equally-spaced imaginary sectors called "houses", as seen from a particular place and time on earth. Typically a horoscope includes a table which shows the angular relationships (or "aspects") between the astrological objects. If the place and time are those of a person's birth, the horoscope is called a "natal chart". A sample natal chart is shown in Fig 1. It is the natal chart which the astrologer uses to derive information about the person's personality and character. The descriptive text thus derived is called a "natal chart interpretation". For the rest of this paper, "astrology" will be taken to mean "natal astrology".

The experiment attempted to test astrology in two different ways:

PART 1 Volunteer subjects gave the information requisite to have their natal charts and interpretations constructed by astrologers. Each then attempted to select his own natal chart interpretation from a group consisting of his own and two other interpretations chosen at random from the group of all the subjects' interpretations. The subjects made first and second place choices; no ties were allowed. Subjects were also asked to rate each interpretation on a 1-10 scale (10 being highest) as to how well each interpretation fit them. If their selections are random (scientific hypothesis) we expect them to select their own interpretation one third of the time. The astrologers predicted, given the design of the experiment, that the subjects would be able to choose their own interpretation "at least half" of the time.

PART 2 The second part of the experiment used the well known and scientifically respected measure of personality traits called the CPI (California Personality Inventory). The participating astrologers were given the natal chart and the CPI test results of a random subject. They were also given two other CPIs chosen at random from the group of all the subjects' CPI test results. The astrologers were then asked to select the two CPIs (first and second choice, no ties allowed) which described personalities closest to the personality indicated by the natal chart. They also rated each CPI on a 1-10 scale (10 being highest) as to how closely its description of the subject's personality matched the personality description derived from the natal chart. The scientific hypothesis predicts a correct choice one third of the time; the astrologers predicted a correct choice half the time or more.

These two parts were used because the first would not be sensitive to biases in the CPI, yet the second would not make the possibly false assumption that the subjects can accurately judge their own personalities. Since a positive astrological effect would be controversial, we decided at the outset to require a 2.5 standard-deviation increase over random choice to interpret the results as favoring the astrological hypothesis. (2.5 is a dividing line in physics experiments often used by skeptics before they are willing to accept a new or startling effect.) Similarly, a disagreement by 2.5 standard-deviations or more would be required to reject the astrological hypothesis in favor of the scientific one. If the statistics did not allow a 2.5 standard deviation hypothesis then we would

draw no conclusion of significance. No data were analysed until all the data had been collected, and all methods of analysis had been established.

EXPERIMENT DESIGN

Primary to the design of the experiment was the elimination of bias, both anticipated and unknown, through extensive use of double blind techniques. All subjects were assigned a five digit random code number. Neither the astrologers nor the experimenter knew what code number corresponded to which person. These lists were solely under the supervision of Richard A. Muller, Professor of Physics at UC Berkeley.

Guidance was sought both from the scientific and astrological communities. To help insure correctness of the testing method and statistical analysis, the scientific advisor was Prof. Muller. It is extremely important that any participating astrologers be respected by the astrological community. To this end we contacted N.C.G.R. (National Council for Geocosmic Research), an organization which has been involved in much astrological research in the past, and which has the respect of astrologers world wide. Tony Joseph (respected astrologer with a Masters degree in Psychology and then Exective Secretary of the national orginization of N.C.G.R.), Michael Caveney (respected astrologer and then president of the San Francisco chapter of N.C.G.R.), and Chris Nelson (respected astrologer, and member of N.C.G.R.) consented to be our astrological advisors. These experts carefully reviewed the experiment design, and made many suggestions.(Valuable suggestions were also made by astrologers Teresa Weed, Geoffrey Dean, and Patrick Curry.) After they were satisified that the experiment was a "fair test" of astrology, they established their predictions (50% for both part one and part two) as the minimum effect they would expect to see. The advising astrologers compiled a list of approximately 90 astrologers with some background in psychology, familiar with the CPI, and held in high esteem by their peers. It was the opinion of the advisory astrologers that a random sample from this list would be able to score at the predicted 50% level. All these astrologers were invited to participate; 28 accepted. (Only two astrologers who participated were not on the original list. They heard of the experiment and wanted to take part. After we discussed their qualifications with Mr. Joseph, they were issued invitations.)

Constructing a natal chart is a simple but laborious mathematical process. Fortunately, computers are ideally suited for the task and several machines designed specifically for this purpose are avaliable on the market. To save time and insure

accuracy, all natal charts were constructed by Mr. Caveney and Mr. Nelson on a Digicomp DR 70 Astrological Computer and spot-checked by hand calculation.

The California Personality Inventory (CPI) is a standard personality test. It was written by Dr. Harrison Gough, Professor of Psychology at UC Berkeley[2] and has been used extensively since 1958 in tests which require quantitative assessment of various personality attributes. It was chosen over the other available personality tests because the advising astrologers judged that the CPI attributes to be closest to those discernable by astrology. By choosing this test we were trying to maximize the ability of the astrologers to do the CPI-natal chart matching without introducing a pro-astrology bias. Other experiments have been done using the CPI with reportably positive results.[3]

The CPI consists of 480 True-False questions. Each question helps to rank a subject on one of 18 personality attribute scales (e.g. dominance, passivity, femininity, masculinity). The subject's score on each scale is compared to the norm score for that scale. The further above or below the norm the subject's score is, the more likely is he to display the characteristic associated with a high or low score on that particular scale. The scores can be plotted on a graph (see Figure 2) which readily conveys this information. Such a graph is called a "CPI profile".

Personality tests were graded, after names had been replaced by code numbers, by volunteers (undergraduate students) who were in no other way connected to the experiment. From spot checks of the grading we determined (95% confidence level) that mistakes by the graders contribute an error of more than 2 points to CPI scores on fewer than 2.6% of the individual scores, an insignificant effect.

Subjects were solicited by advertisements in Bay Area newspapers, classroom announcements, and postings on and off the UC Berkeley campus. (In order to protect the confidentiality of the data and the rights of the subjects, all procedures were checked by the University of California Office of Fair Treatment to Human Subjects prior to the beginning of data collection.) Since much of the soliciting was done on campus, approximately 70 percent of the subjects were college students and about one half of these were graduates. All subjects were required to fill out a questionnaire with their natal data (birthday, including exact time and location of birth). In addition, they were asked to select whether they: i) believe in astrology, ii) believe somewhat, iii) have no opinion, iv) disbelieve in astrology, or v) strongly disbelieve in astrology, and whether or not they had ever had a natal chart constructed before. They were not told that these questions affected subject selection. All subjects who chose "v) strongly disbelieve" were eliminated on the grounds that this opinion could bias them either consciously or subconsciously against selecting the interpretation which best fit them. All those who

had ever had a chart constructed before were eliminated because they might be able to select (or reject) the correct interpretation based on knowledge of what to expect. Strong believers who had never had their charts done were not eliminated, since this belief alone could not help them select the correct interpretation except for possible "Sun Sign" bias, which we will discuss in detail later. (We found no significant sun-sign bias.) All subjects had to be at least 17 years old. All applicants were invited to take the CPI; failure to take the CPI resulted in rejection.

It is of course possible that between the time that a subject submitted his natal data and was handed the final natal interpretations (typically 8-10 weeks) he may have had his natal chart constructed elsewhere, or may change his opinion about the feasibility of astrology. To avoid this problem all subjects were required to fill out a new questionaire before being asked to choose their own natal interpretations ("part 1" of the experiment). Two subjects were eliminated at this point, one who admitted to being a professional astrologer (and who had apparently lied on the first questionaire) and another subject whose opinion of astrology had changed from "disbelieve in astrology" to "strongly disbelieve in astrology".

No subject ever knew the particulars of the experiment, only the general procedure and what was expected of him.

We encouraged prospective subjects to participate by promising them a copy of their natal chart, CPI test results and interpretation, the completed natal interpretation, and a copy of the final results of the experiment. This incentive tended to bias the sample toward those who either had no opinion or who tended to believe in astrology.

Although we required only a 2.5 standard deviation effect to interpret the results as favoring the astrological thesis, we originally planned to be able to distinguish between the two hypotheses at a four standard deviation level. Thus, the number of subjects required was chosen to be 128.[4] An additional 128 subjects were chosen to act as a control group; this group was treated exactly like the test group. Thus the total number of subjects was originally 256. Many of these original subjects did not complete all phases of the experiment. Many subjects lost interest in the project and did not return their data to us. Some subjects moved in the time (typically 8-10 weeks) it took to get all the test materials out to them and did not leave a forwarding address. Two roommates became fanatically convinced that astrology was the work of the devil, and refused to continue to participate in what they called "an experimental test of evil". We were forced to eliminate 12 subjects due either to their not following directions correctly, or to not returning all the needed materials to us. The use of double blind techniques is most important during this stage of the experiment. During the process of

rejection of data, the experimenter had no access to the information necessary to be able to introduce biases in favor of either the scientific or astrological hypothesis. In the end only 177 subjects (83 test group, 94 control) remained for Part 1 of the experiment. Neither were we able to collect all the data we had hoped to in Part 2 of the experiment. First, fewer astrologers than hoped for agreed to participate. Only 224 data envelopes were mailed to 28 astrologers. Some of these astrologers simply refused to participate as promised. Some declined after they discovered how much time was required on their part. One tried to bargain his services in exchange for free access to all our raw data, and declined to participate when his terms were refused. For these reasons, we obtained only 116 usable subjects for Part 2 of the experiment. The large reduction in numbers was unanticipated and reduced the expected discrimination between hypotheses for Part 1 to 3.2 standard deviations, and for Part 2 to 3.9 standard deviations. However we do not believe that the loss of data could bias the results of the experiment in any significant way.

## BIASES/CONTROLS

Experiments using human subjects are subject to a special class of biases which do not normally have to be considered by a physical scientist. An experiment must be designed so that the psychology of the subjects will not alter the results. The major potential biases which required specific control in the experiment design were as follows:

Sun sign bias. The "sun sign" refers to the constellation of the zodiac (i.e. Aries, Taurus, etc.) in which the sun resides when the person is born.[5] If the sun sign should play an important role in the average chart and if people are generally familiar with the characteristics of their sun sign (e.g. through newspaper horoscopes, etc.) one might expect people to select the correct interpretation at a better-than-chance level regardless of whether or not the astrological hypothesis is correct. We refer to this as "Sun Sign Bias".

To correct for this, each member of the test group was matched to a member of the control group who was born under the same sun sign. Following the consulted astrologers' recommendations, we required that the age difference between these subjects be at least three years so that their natal charts would be "sufficiently dissimilar". As defined by the consulted astrologers, this meant that every planet from Saturn inward will be likely to have changed location by sign and house.

Otherwise, the assignment was made randomly. Both subjects, test and control, were given the same three interpretations. The control subject was therefore not given his own interpretation at all.

If the astrological hypothesis is false, members of both groups should correctly identify the test subject's interpretation with equal frequency. If the astrological hypothesis is true, however, the test group should score significantly higher than the control.

Psychologically appealing/unappealing charts. It is possible that some interpretations will be more complimentary, or in other ways more psychologically appealing, than others. Exactly how this could bias the results is impossible to determine. It is possible to conceive of cases where the results would be biased in favor of or against astrology.

The control group as described automatically eliminates this bias, since we were comparing the hits and misses between the test and control groups.

Biases in the interpretations. The interpretations must not contain informaton which subjects could use to better the odds of selecting the correct one without the astrological hypothesis being true. For example, no information about the chart itself was given. (A subject could know he has "Aries ascending" without having had a chart erected or knowing what it means. If this person finds an interpretation which says "Aries ascending" he has a good chance of being correct if he picks it.)

Regional bias. Subjects are likely to have lived for a few years in the area in which they were born. Since psychologists believe that the basic personality is largely shaped during this period, the environment in which we spend our early years is likely to leave its marks on our personalities. For example, people born in rural areas may have strong feelings about animals. Should an astrologer know the exact place of a person's birth, he may either consciously or subconsciously use this information despite the fact that it is not part of the natal chart. We call this "Regional Bias".

To help correct for this, the location and time of birth were removed from all charts before they were handed to the astrologers. Charts vary so widely that it is impossible just to look at one and tell the exact location and time of birth no matter how expert the astrologer. It is true that the chart is uniquely determined by the birth data, so an astrologer could work backwards from the chart and deduce the

natal information; but the process is usually difficult and time consuming, making it sufficiently difficult to obtain the natal data and not a worthwhile effort. Also, this bias is not expected to affect the results significantly, since it presupposes that the astrologers are very familiar with the regional-personality correlations and that, given this information, they will be able to construct interpretations which subjects will be able to select at a statistically significant level.

Format bias. In order to eliminate the possibility that subjects could pick up clues other than the astrological informations we were testing, and to insure the kind of information given the subjects was as uniform as possible, the interpretations followed a predetermined and carefully selected format. It gave the astrologers what factors to derive from the chart and set a limit on the length of written material.

The format itself was developed by a collaboration of the advising astrologers and the experimenter. It was designed to give the individual the best possible chance to select the correct interpretation without giving any unfair or nonastrological clues. The specific categories which astrologers were required to address were: (1) Personality/Temperment, (2) Relationships, (3) Education (4) Career/Goals, and (5) Current Situation.

The astrologers typed each interpretation on pages supplied by the experimenter and containing the proper headings. Again, the purpose here was to keep the interpretations as uniform as possible.

The format also gives the following guidelines: (1) No advice or predictions were to be given. Such information could not help the subject select the correct interpretation, and he is likely to take it with equal weight in evaluating the interpretation. He may well discard an accurate description because he disagrees with the advice or predictions given. (2) No direct reference to the chart was to be made (e.g. "you have sun in Leo"). (3) No information relating to the subjects' ages was to be given.

Subjects were asked to rate each section of each natal interpretation on a 1-10 scale. Then they were asked to write down, for each section, the code number of the interpretation which fit them best and second best. (These data were later rejected; see Results/Conclusions.)

Control for incomplete or inaccurate self-knowledge. One's ability to select the correct description of himself, given a group of descriptions, depends on how well he knows himself. If people generally have an inaccurate self-image then one would not expect the subjects to select the correct interpretation no matter how well astrology worked. We devised the following scheme to understand this potential bias.

The CPI is generally accepted by psychologists as a moderately accurate description of a person's personality. Each test subject was given his own CPI profile and two others randomly selected from the group. He was then asked to select the profile which he felt best fit him. To do this each was provided with the following: i) three sample CPI profiles; ii) a synopsis of what high and low scores in each category tend to be seen as for males and females; iii) a letter explaining about a CPI profile and how to actually go about making the selection.

Since it was necessary to control for possible psychological bias, we had to establish a test and control group. Since the test and control groups established for Part 1 were sufficently random, we elected to use the same test and control groups for ease of implementation. However, since the CPI is graded on different scales for males and females, we had to match male (female) test group members to male (female) control members. Thus, the test-control group assignments had to be reestablished.

Sex information bias. Personality tests are graded according to male and female norms. By knowing the test scores, an astrologer might be able to determine the probable sex of the subject and eliminate those personality tests not of the same sex. Also, they could add information generally true for one sex and not for the other. Giving them this information would have greatly complicated our controls. To eliminate this bias, the astrologers were not told the sex of any of the subjects.

Verification of natal data. Obviously, since the natal chart depends entirely on the natal data, inaccuracies in the natal data would produce inaccuracies in the natal chart. The astrologers insisted that the birth time be accurate to within 15 minutes. In order to assure this, when the subjects took the CPI they were obliged to show documentation of their natal data including, especially, birth time. Although we preferred birth certificates, hospital or county records, or other "official" documentation, we also accepted baby books, as long as the birth time was recorded

when the child was born. "Mother's memory" or having the time read over the telephone from a "documented" source was not acceptable. Some subjects were unable to furnish the proper documentation at the time they took the CPI, but were able to send a copy to us a short time later. This was also acceptable. To abide by University policy, no birth certificates or other such documentation were collected or retained.

DOUBLE-BLIND PROCEDURES

An important difference between this test and many done before is its extensive use of double blind techniques. The important proceedures we followed are outlined below.

Assignment of code numbers/natal data cards. As soon as the subjects had taken the CPI, their questionnaires were put into alphabetical order and given to an assistant who assigned a five random digit code number to each in turn. No two subjects were assigned the same code number. The assistant then filled out three 3x5 index cards for each subject. On the first he put Name-Code Number; these he filed in alphabetical order. On the second he put Code Number-Name; these were filed in numerical order. The purpose for these cards was for easy record-keeping. These cards were maintained under the supervision of Prof. Muller, and could be released to the experimenter only with Prof. Muller's consent. At no time during the data collection did the experimenter have access to any information relating subjects' identities to code numbers. This control was abandoned only when the all the data had been collected and the methods of analysis had been established.

The assistant also made a third set of cards each containing the code number of a particular subject and his natal data. These cards were given to astrologers Michael Caveney and Chris Nelson in envelopes unopened by the experimenter, for the construction of natal charts. Since the CPI was given at three different times (typically about 4 weeks apart), not all the assignments were made at the same time, nor did the astrologers receive all the natal data cards at one time. They did receive, however, the natal data cards within five days of the CPI testing dates.

Test-control group selection/matching. All subjects who failed to show documentation of birth time, date, and location when they took the CPI were automatically put into the control group (there were 43 such subjects). All questionaires in each group

were sorted into twelve sun sign groups. We then randomly assigned subjects to the control group until the number of control group members equaled the number of subjects remaining in each sun sign group. The remaining subjects comprised the test group. If there was an odd number of subjects in a sun sign group, the odd person was put in the control group. The questionnaires in each sun sign group were then shuffled thoroughly and the names and birthdates were listed in the order in which they landed. As stated earlier, we required the birth dates to be at least three years apart to insure that the natal charts were sufficiently dissimilar. The first test subject of each sun sign group was then matched to the first control subject of the same group whose birth date was far enough apart. We did the same thing for the second, third, etc. test subjects until all the test and control subjects remaining had birthdates within three years of each other (this happened in all 12 sun sign groups). To include these remaining subjects, we were forced to do some rematching. We accomplished this in the following way: we started at the top of the control group and went down until we found a birthdate which satisfied the following requirements :1) it was at least three years away from the unmatched test person; and 2) the birthdate test group member to which it was attached was at least 3 years away from one of the unmatched controls. We then rematched the originally-matched control group member with the previously unmatched test subject, and matched the unmatched control group member with the previously matched test member. This was continued until all the test and control group subjects were matched. Due to seven sun sign groups having an odd number of subjects, there remained seven unmatched control group members.

For the second part of the experiment male (female) test members had to be assigned to male (female) control members. Thus, the above test subject to control subject matchings had to be redone. Since the test and control groups were randomly chosen, no changes in them were made. However, all the matchings changed as male (female) test subjects were randomly matched to male (female) control subjects.

Preparing self selection materials for subjects. Each subject was given two envelopes, one containing the needed materials for the selection of the natal chart interpretation, and the other containing the materials for the selection of the CPI profile. The natal interpretation envelope contained: 1) three natal interpretations; 2) a pretyped sheet on which the subjects were to detail their choices; 3) a questionnaire asking their opinion of astrology and whether they had had their chart

done before (See Experiment Design); 4) a letter explaining how they were to go about making the selections. The CPI envelope contained: 1) Three CPI profiles; 2) a preformatted sheet on which the subjects were to detail their first and second place choices, plus 1-10 ratings; 3) a summary of what the CPI scores mean; 4) a letter explaining how they were to go about making their selections. Since we had labeled the natal charts with the code number of the person for which they were constructed, we could not do the same with the CPIs, since the subjects might recognize a code number which appears twice. The CPIs were first labeled with the code numbers of the person to which it corresponded, then relabeled in the following way: let x = ln(1/ (code #)). We found x for each code number on a hand calculator and then took the last 5 digits on the calculator display as the new code number. The new code numbers were typed on labels and affixed to the CPI profiles. All natal interpretations and CPI profiles were put in numerical order in the envelopes.

Materials for the astrologers. The astrologers were sent materials in two separate mailings. In the first mailing, each astrologer received: 1) the number of natal charts he had agreed to interpret when he chose to take part (typically 4); 2) a copy of the format by which the charts were to be interpreted; 3) the paper (with headings) on which the interpretations were to be typed; 4) a letter explaining the symbols used on the computer constructed natal charts, deadlines, and when they may expect the materials for part two of the experiment; 5) a postage-paid return envelope for the data. After they had returned the natal charts and interpretations to us, the astrologers received the second mailing containing: 1) the number of natal charts (plus three CPIs for each natal chart) which they had agreed to match to CPI profiles; 2) a copy of "The Interpreter's Syllabus for the CPI"[6] (a booklet explaining all the CPI attributes and how to interpret them in detail); 3) a preformated sheet on which the astrologers were to detail their first and second place choices and 1-10 ratings; 4) a letter explaining how to go about making the choices; 5) a postage-paid return envelope for the data. To save the astrologers work, they were allowed to make the CPI matchings to the natal charts they had already interpreted. They were also typically sent an additional natal chart and CPIs to match. To insure that the astrologers would not mix up the the CPI profiles between natal charts, the three profiles for each natal chart were ordered randomly, then labeled (code # of natal chart) a,b,c, respectively. All methods of ordering the materials were kept secret from all those not directly involved in putting these materials together for the subjects and astrologers.

A total of 226 natal charts were sent out to be matched with CPI profiles. Of these, only 15 had no documentation of birth time. None of these 15 were returned by the astrologers to be included in our data.

All subjects took the CPI exam in a quiet, proctored atmosphere. We provided times on the U.C. Berkeley campus for the subjects to return and make their CPI profile and natal interpretation selections in a similar atmosphere. Appromimately 2/3 of the subjects did so. The remaining 1/3 were unable to come at any of the possible times and were mailed their materials along with a special set of instructions to aid them in making the selections at home, and were allowed to return their data in a post paid envelope. They were required to sign a statement stating that they had made their selections in a quiet, undisturbed place. Eight subjects who did not return the statement signed had their data eliminated.

RESULTS

PART 1: Subject selection of natal chart interpretations.

After a predetermined data collection period of 10 weeks we had astrological data from a total of 83 test group and 94 control group subjects and CPI self selection data from a total of 56 test group and 50 control group subjects. The data are displayed in Table 1.

The test group selected the correct interpretations as its first place choice at the 0.337 ± 0.052 rate, while the control did so at the 0.447 ± 0.049 rate, 2.34 sd above chance. Although this fluctuation is less than 2.5 sd, less than the level we had chosen to call "significant", it does require comment. Since this fluctuation occurred in the control group and control subjects were not given their own interpretations, this cannot be interpreted as a possible astrological effect. Neither can it be correctly attributed to sun sign bias, since the test group did not score near the same level. We thus interpret this as a statistical fluctuation. The test group chose the correct interpretation as second best describing them at the 0.398 ± 0.052 rate while the control group did so at the 0.362 ± 0.049 rate. Finally, the correct interpretation fell as the test group subjects; third choice at the 0.265 ± 0.052 rate and did so in the control group at the 0.191 ± 0.049 rate. All this is consistent with the scientific hypothesis.

When the first few data envelopes were opened we noticed that on any interpretation selected as a subject's first choice nearly all the subsections were also

rated as first choice. We then realized that we had no way of guaranteeing that subjects were rating each section of the interpretations independently of other sections they had already read. Without such a guarantee spurious results favoring either hypothesis could have easily appeared. So we rejected these data as not having been collected under the proper controls.

Next we looked to see how well the subjects were able to select the correct CPIs. The test group selected the correct CPI as their first place choice at the 0.446 ± 0.063 rate, while the control did so at the 0.420 ± 0.066 rate, showing no significant difference between the two groups. The test group chose the correct CPI as their second place choice at the 0.286 ± 0.063 rate while the control did so at the 0.260 ± 0.066 rate, again no significant difference between the two groups. Finally, the test group chose the right interpretation as their third place choice at the 0.268 ± 0.063 rate while the control group did so at the 0.320 ± 0.066 rate. Once more, there is no significant difference between the two groups.

PART 2: Natal Chart-CPI matching.

A total of 116 data envelopes were returned by the astrologers. In the 116 envelopes there were a total of 116 first place choices, 114 second place choices and 320 ranked choices (weight factors indicating how well the astrologers felt the natal chart matched each CPI, on a scale of 1 to 10). The data are displayed on table 2.

The data were first analysed without taking the 1-10 weight factors into account. The astrologers selected the correct natal chart as their first place choice at the 0.34 ± .044 rate, in agreement with the scientific hypothesis of 0.33 and in disagreement with the astrological hypothesis of 0.5 by 3.3 standard deviations. The correct CPI was chosen as the second place choice at the 0.40 ± 0.044 rate which is also consistent with the scientific hypothesis. (The astrologers made no firm prediction about the second place choice.) The correct CPI was chosen as the third place choice at the 0.25 ± 0.044, again consistent with the scientific hypothesis. (It is two standard deviations below 0.33, but within the established 2.5 standard deviation requirement. The astrologers made no firm predictions about the third place choice.)

Next we took the weights into account, by a method established before studying the data. (The establishment of methods before data analysis is important in order to prevent the subtle bias that comes from selection of analysis procedures.) We first made a histogram of the weights which the astrologers assigned to all their first place choices,

regardless of whether or not those choices were correct. This histogram is displayed in Fig. 3. The data are sharply peaked at a weight of about 8. The second histogram in Fig 3 shows the ratings of only those first place choices which were correct. If the astrological hypothesis were true, one might expect the correct first place choices to have higher weights on average (that is they better fit the natal charts) than the whole group of first place choices. Thus, the new histogram should be skewed to the right. On comparing the two histograms however we see that they are very similar; no such skewing appears.

The scientific hypothesis predicts that 1/3 of the choices at any weight should be correct choices. Figure 4 shows the percentage correct for each weight with the appropriate error bars, and the best linear fit with slope $-0.01 \pm 0.02$. The slope is consistent with the scientific prediction of zero slope. The same analysis on the second and third place choices yields Figures 5 (a), (b), and 6(a), (b), respectively. The slope of the best linear fit to the data on Fig 6(a) is $0.019 \pm 0.02$ while that of Fig 6(b) is $0.026 \pm 0.02$, both consistent with the scientific hypothesis (zero slope).

## CONCLUSIONS

From the results of Part 1 (subjects selecting interpretations) we notice that the test group scored at a level consistent with chance and within 2.5 sd of the control group. The large (2.34 sd) but not significant (less than 2.5 sd) fluctuation in the control group is attributable to statistical fluctuation, not to a sun sign bias. These results are consistent with the scientific hypothesis. However we cannot use the result to rule against the astrological hypothesis because the test subjects were also unable to select their own CPI profile at a better-than-chance level. At the 95% confidence level, the test subjects were unable to select their own CPI profile at better than the 0.57 rate. There are many reasons which could explain why the test subjects were unable to select the correct CPIs at a higher rate:

1) Subjects may have had difficulty relating to the graphical presentation of the CPI information.
2) Some subjects may have recognized correct information about themselves, but subconsicously chose a CPI which did not describe them as well to avoid admitting they have certain character traits. Such denial in a large percentage of the subjects would tend to cancel a positive effect.
3) The CPI may not test the kind of attributes by which subjects may easily recognize themselves.
4) People may be unable to recognize accurate descriptions of themselves.

Our experiment does not distinguish between these possibilities. Prof. H. Gough (author of the test and respected experimental psychologist) is familiar with nearly all published experiments using the CPI. At our request he searched through the literature for any experiment demonstrating the ability of test subjects to recognize accurate descriptions of themselves. To his and our knowledge, no other test of this kind has ever been done. Thus, we believe there exists presently no scientific evidence from which one can conclude that subjects can select accurate descriptions of themselves at a significant rate.

If subjects cannot recognize accurate descriptions of themselves at a significant level then the experiment would show a null result no matter how well astrology worked. On the other hand, any astrological effect demonstrated in this way would require a consistency check. One would have to see if subjects could recognize the kind of information astrologers give them about themselves, which was derived in a manner known to be reliable. Thus, until and unless such a self-recognition ability can be shown, we conclude that subject selection of astrologically derived information is a poor test of astrology. (This is a problem in approximately 30% of all experiments which claim a significant astrological effect.)

The conclusions to be reached from Part 2 (CPI-natal chart matching) of the experiment are somewhat more illuminating. What is striking about these data is how poorly the astrologers performed, when their performance is compared to their predicted rate. It is consistent with chance, and is at the very significant 3.3 standard deviation level below the astrologers' prediction. This is well beyond the 2.5 sd requirement we established before the beginning of the experiment as sufficient to refute the astrological hypothesis.

Before the data had been analyzed, we had decided to test to see if the astrologers could select the correct CPI profile as either their first or second choice at a higher than expected rate. The scientific hypothesis predicts the CPI will fall in the first or second choice 66% of the time. The astrologers did not make a specific prediction as to what they expected the rate to be. If the correct CPIs are chosen in the first and second place choices, then they will be depleted from the third place choice. Since the rate at which the astrologers chose the correct CPI as their third place choice was consistent with chance, we conclude that the astrologers were unable to chose the correct CPI as their first or second choices at a significant level.

In Figure 4 the data are clearly inconsistent with the "at least" 0.5 level predicted by the astrologers. Nor do the data suggest that the astrologers are more likely to be correct when they weight a CPI as well fitting the particular natal chart than they are

when they weight it as poorly fitting the natal chart. The data appear randomly scattered about the 0.33 line and is hence consisitent with chance. The scientific hypothesis predicts a line of zero slope, consistent with the slope observed. Figs. 5a-b and 6a-b likewise show no convincing evidence that the astrologers tended to weight the correct CPIs higher than the incorrect CPIs.

We are now in a position to argue a surprisingly strong case against natal astrology as practiced by reputable astrologers. Great pains were taken to insure that the experiment was unbiased and to make sure that astrology was given every reasonable chance to succeed. It failed. Despite the fact that we worked with some of the best astrologers in the country, recommended by the advising astrologers for their expertise in astrology and in their ability to use the CPI, despite the fact that every reasonable suggestion made by the advising astrologers was worked into the experiment, despite the fact that the astrologers approved the design and predicted 50% as the "minimum" effect they would expect to see, astrology failed to perform at a level better than chance. Tested using double-blind methods, the astrologers' predictions proved to be wrong. Their predicted connection between the positions of the planets and other astronomical objects at the time of birth and the personalities of test subjects did not exist. The experiment clearly refutes the astrological hypothesis.

ACKNOWLEDGMENTS

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FOOTNOTES AND REFERENCES

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The following references are for scientists who wish to familiarize themselves with astrology as astrologers practice it.

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3. See, for example, "The Astrological 'Theory' of Personality: An Unbiased Test by a Biased Observer." Robert J. Pellegrinli, The Journal of Psychology, 1973, 85, 21-28.

4. We wish the astrologically predicted number of correct choices (n/2) to be four standard deviations above the number expected by chance (n/3), or

$$n/2 = 4 \ (n\ p\ (1-p)) + n/3$$

Here, p = 1/3. Solving this equation for n yields n = 128.

5. Astrologers also make an alternate definition. The sky around the apparent path of the "planets" is divided into 12 equal sectors, starting at the position where the sun appears to cross the equator at the spring equinox of the northern hemisphere. The sectors are labelled "Aries", "Taurus", etc. in the order of the Zodiacal constellations. These define the "Tropical Zodiac". Often, the "sun sign" refers to the imaginary sector in which the sun resides.

6. Gough, H.G., "An Interpreter's Syllabus for the CPI". In P. McReynolds (ed.), Advances in Psychological Assessment, Vol. 1 (Science and Behavior Books: Palo Alto, CA), 1968.

TABLES

Table 1) Data from subject selections of natal chart interpretations.

Table 2) Data from astrologers matching natal charts to CPI profiles. Data consistent with chance, inconsistent with astrological hypothesis.

FIGURES

Fig 1) Computer derived "natal chart", showing positions of astrological objects as seen from the time and place of a person's birth.

Fig 2) A typical CPI profile.

Fig 3 Histogram showing weights assigned by astrologers to the CPI profiles they felt best fit the natal charts. CPI profiles weighted higher are not more likely to be correct.

Fig 4 Graph showing percentage correct vs weight for astrologers first place choices in CPI profile natal chart matching. The best linear fit is consistent with the scientifically predicted line of zero slope. No significant tendency for the astrologers to be more correct when they rate a CPI as highly matching a natal chart.

Figs 5(a),(b) Histograms showing weights assigned to astrologers' second and third place choices.

Figs 6(a),(b) Percentage of correct CPI profiles vs. weights, chosen by astrologers as their second and third place choice. Best linear fits are consistent with chance.

TABLE 1

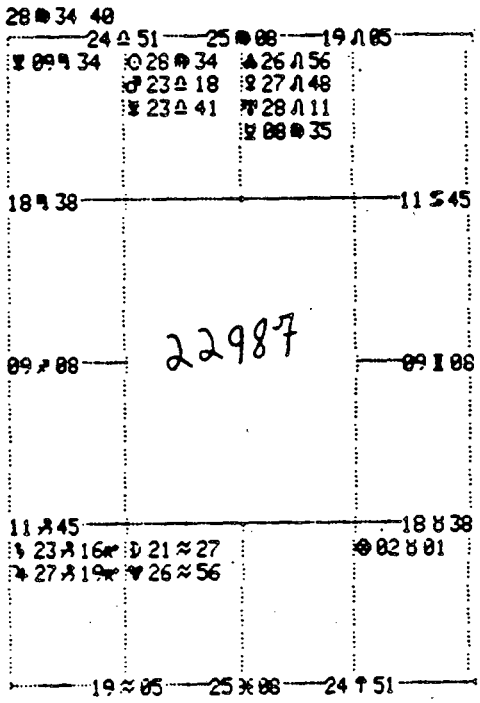
Data From Subject Selections
Of Natal Chart Interpretations

| | TOTAL | FIRST CHOICE | SECOND CHOICE | THIRD CHOICE | EXPECTED | |
|---|---|---|---|---|---|---|
| TEST GROUP | 56 | 25 | 16 | 15 | 18.67 ± 3.53 | CPI PROFILE SELECTION |
| CONTROL GROUP | 50 | 21 | 13 | 16 | 16.67 ± 3.33 | |
| TEST GROUP | 83 | 28 | 33 | 22 | 27.67 ± 4.29 | INTERPRETATION SELECTION |
| CONTROL GROUP | 94 | 42 | 34 | 18 | 31.33 ± 4.57 | |

TABLE 2

Date From Astrologers Matching Natal Charts To CPI Profiles.
Data Consistent With Chance, Inconsistent With Astrological Hypothesis.

| | (n) Total | Chance ($\frac{n}{3}$) Expected | SD | Astrologers Predicted ($\frac{n}{2}$) Expected | SD | # of Correct CPI Chosen | SD Away From .35 | SD Away From .50 |
|---|---|---|---|---|---|---|---|---|
| FIRST CHOICE | 116 | 38.5 | 5.1 | 58.5 | 5.4 | 40 | +.256 | 3.34 |
| SECOND CHOICE | 114 | 38.0 | 5.0 | none | | 46 | +1.48 | --- |
| THIRD CHOICE | 114 | 38.0 | 5.0 | none | | 28 | 2.0 | --- |




C1 NATAL TROP P.LONG KOCH ZOD
H01

| | | |
|---|---|---|
| H01 | = | 09♐08 |
| H02 | = | 05♑59 |
| H03 | = | 09♒38 |
| H04 | = | 25♓08 |
| H05 | = | 19♈58 |
| H06 | = | 14♉29 |
| H07 | = | 09♊08 |
| H08 | = | 05♋59 |
| H09 | = | 09♌38 |
| H10 | = | 25♍08 |
| H11 | = | 19♎58 |
| H12 | = | 14♏29 |

C1 SEC TROP P.LONG KOCH ZOD
DATE RECL = 4.01.1981

C1 SEC TROP P.LONG KOCH ZOD ☉

| | | |
|---|---|---|
| ☉ | = | 17♎47 05 |
| ☽ | = | 05♏52 |
| ☿ | = | 08♏01♑ |
| ♀ | = | 21♍39 |
| ♂ | = | 06♏29 |
| ♃ | = | 27♑50 |
| ♄ | = | 23♑24 |
| ♅ | = | 29♌11 |
| ♆ | = | 10♏12 |
| ♇ | = | 09♍11 |
| ⚷ | = | 25♌56♋ |

C1 NATAL TROP P.LONG KOCH ZOD
☉ SCAN ☽

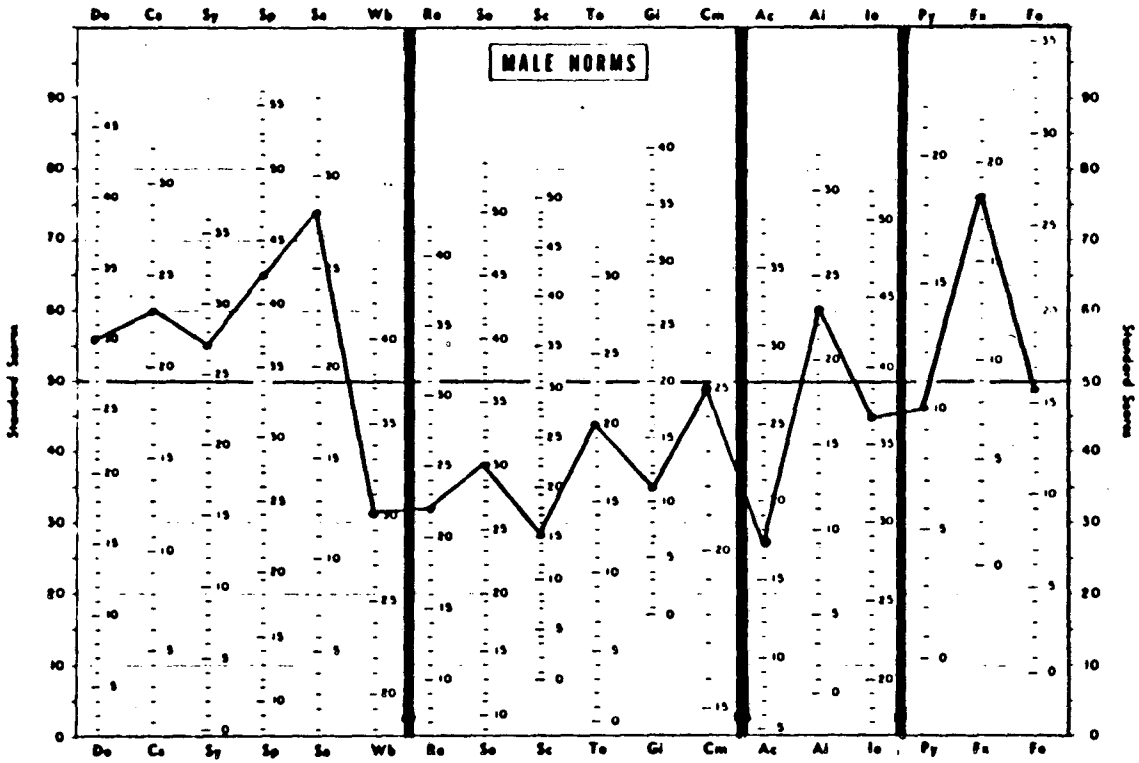
| ORB | 10°00' ☉ | ☽ | ☿ | 10.01 ♀ | ♂ | ♃ | 11.11 ♄ | ♅ | ♆ | ♇ | ⚷ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ☉ | | 7 ♐ 07 | 4 ♑ 54 | 0 ♑ 47 | 5 ♑ 17 | 1 △ 15 | 5 △ 19 | 0 ♑ 24 | 4 ∠ 01 | | 1 ♑ 38 |
| ☽ | | | 2 △ 13 | 6 ♂ 20 | 1 △ 50 | 5 ♑ 52 | 1 ♑ 49 | 6 ♂ 43 | | | 5 ♂ 29 |
| ☿ | | | | 4 ⚹ 07 | 0 ☌ 23 | 3 □ 39 | 0 □ 25 | 4 ⚹ 30 | | 6 ⚺ 20 | 3 ⚹ 16 |
| ♀ | | | | | 4 ⚹ 30 | 0 ♐ 28 | 4 ♐ 32 | 0 ☌ 23 | 0 ♌ 14 | | 0 ☌ 51 |
| ♂ | | | | | | 4 □ 02 | 0 □ 01 | 4 ⚹ 53 | | 6 ⚺ 43 | 3 ⚹ 39 |
| ♃ | | | | | | | 4 ☌ 03 | 0 ♐ 51 | 5 ♌ 46 | 3 ♍ 44 | 0 ♐ 23 |
| ♄ | | | | | | | | 4 ♐ 55 | 1 ♌ 42 | 0 ♍ 19 | 3 ♐ 40 |
| ♅ | | | | | | | | | 0 ♌ 37 | | 1 ☌ 14 |
| ♆ | | | | | | | | | | 0 ⚹ 59 | 0 ♌ 37 |
| ♇ | | | | | | | | | | | |
| ⚷ | | | | | | | | | | | |

XBL 832-8314

Figure 1

Name 10119 Age Date Tested

Other Information




**Notes:**

CPI SCALES

| | |
|---|---|
| Do | Dominance |
| Cs | Capacity for status |
| Sy | Sociability |
| Sp | Social presence |
| Sa | Self Acceptance |
| Wb | Sense of well-being |
| Re | Responsibility |
| So | Socialization |
| Sc | Self-control |
| To | Tolerance |
| Gi | Good impression |
| Cm | Communality |
| Ac | Achievement via conformance |
| Ai | Achievement via independence |
| Ie | Intellectual efficiency |
| Py | Psychological-mindedness |
| Fx | Flexibility |
| Fe | Femininity |

Figure 2

XBL 832-8315

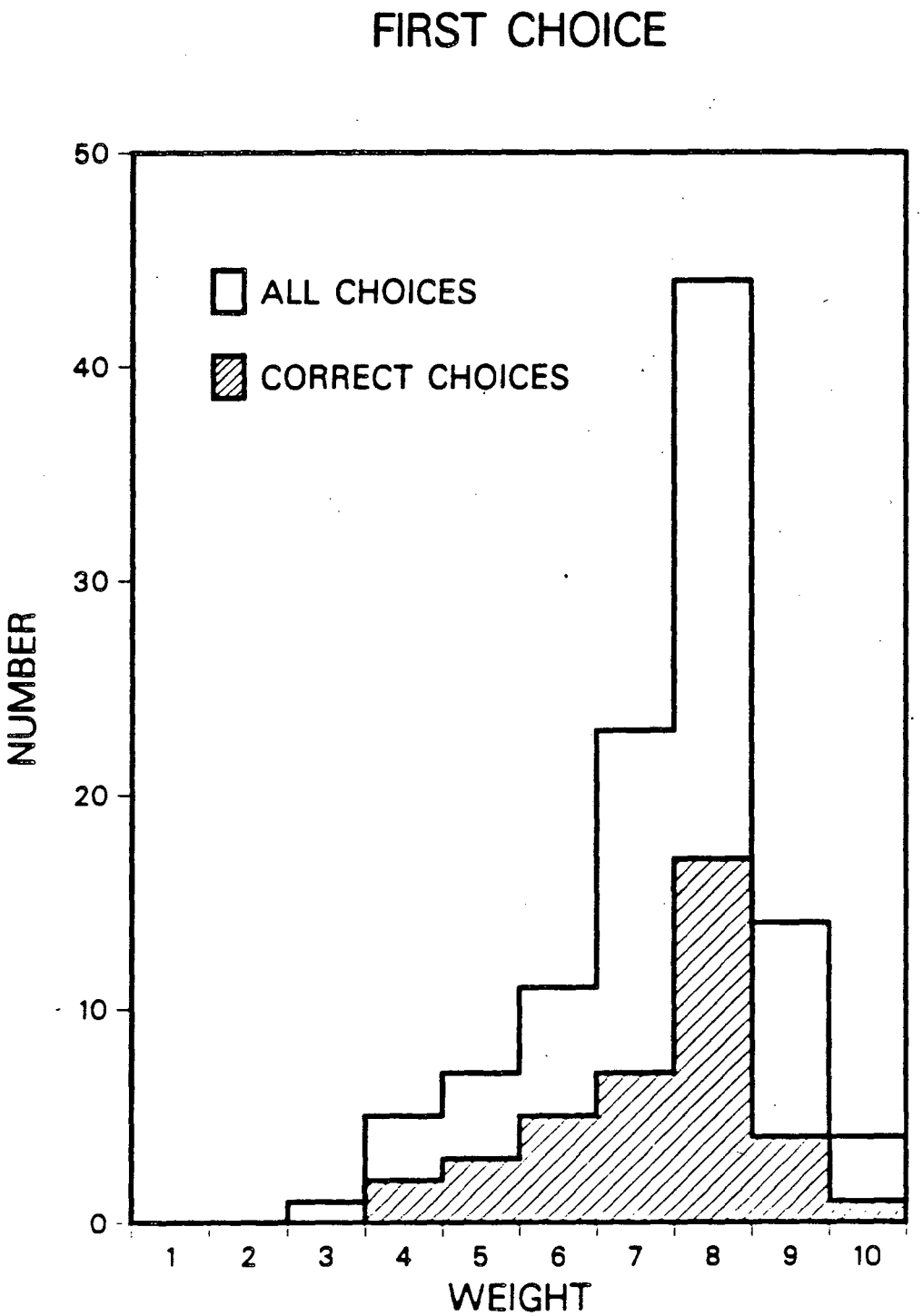



Fig. 3

XBL 832-7000

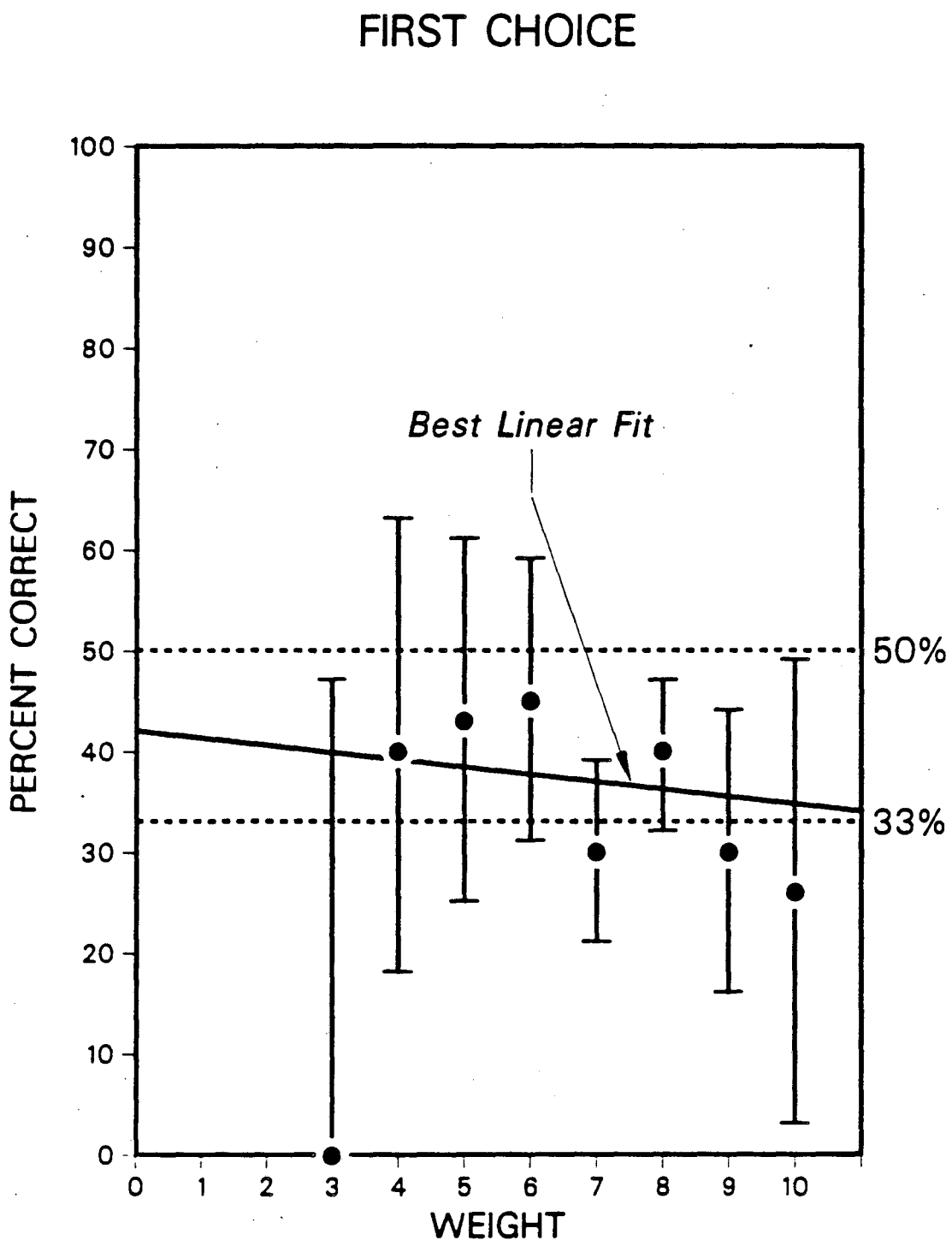



Fig. 4

XBL 832-7002

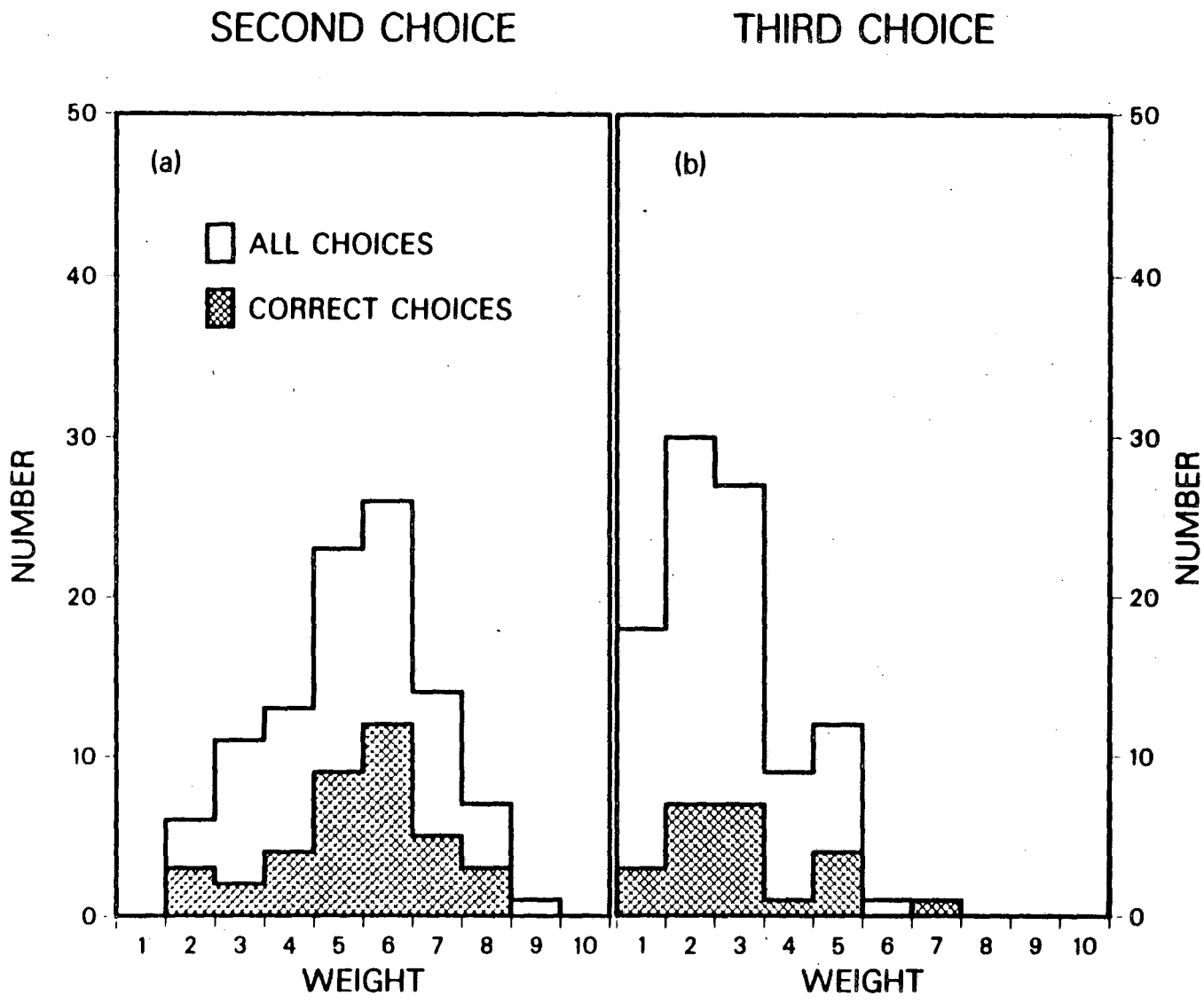



Fig. 5

XBL 832-7001

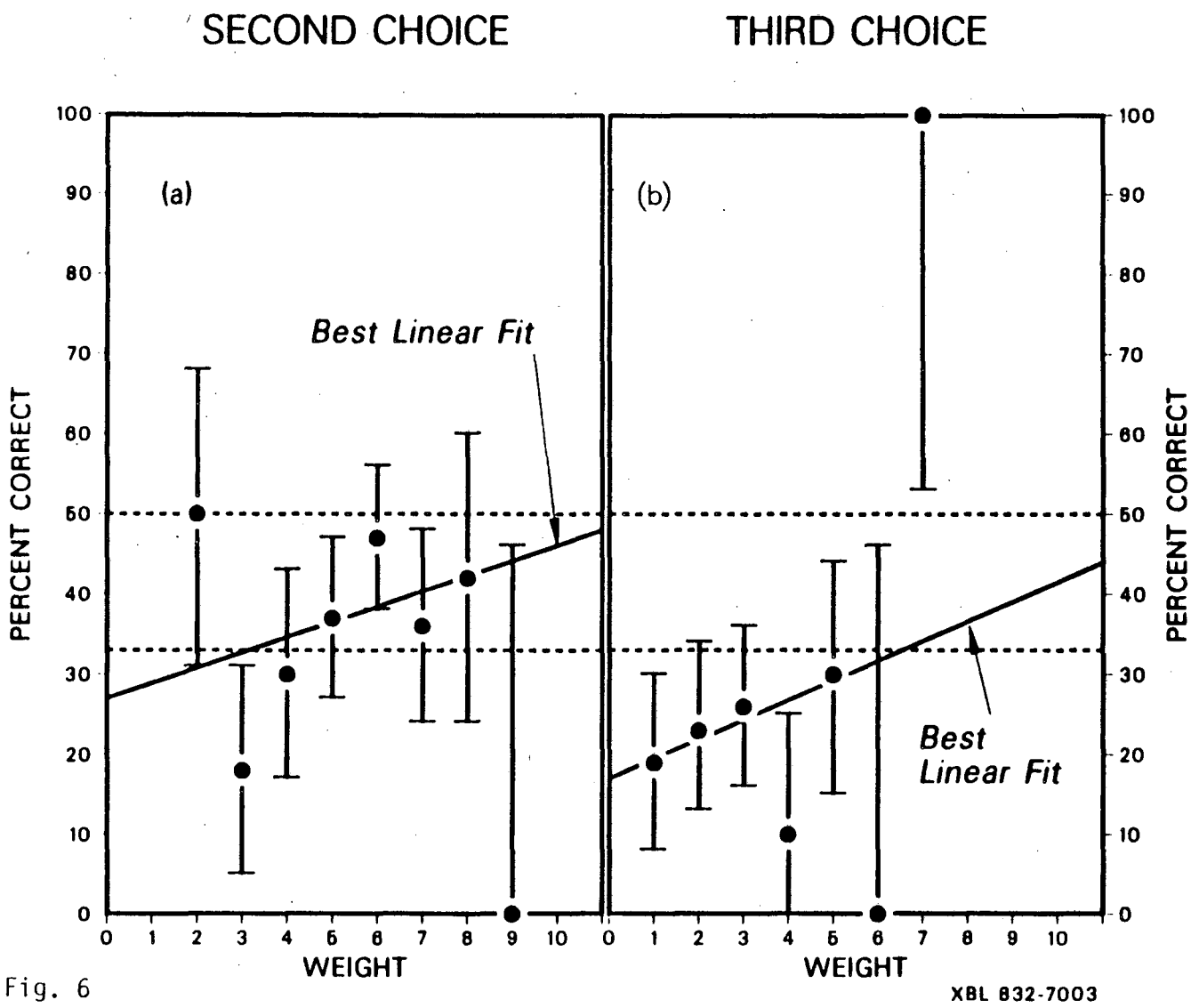

SECOND CHOICE
THIRD CHOICE
(a)
(b)
Best Linear Fit
Best Linear Fit
PERCENT CORRECT
PERCENT CORRECT
WEIGHT
WEIGHT
0
10
20
30
40
50
60
70
80
90
100
0 1 2 3 4 5 6 7 8 9 10
XBL 832-7003

Fig. 6

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