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Experimental Study on the Bending Deformation of Steel Wire by Psychokinesis

The Case of Stainless Steel Weights (Non-Magnetic)

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Abstract

To investigate the effects of PK (psychokinesis) on the mechanical properties of metal, a simple beam type bending test was performed by four boys who have special PSI energy.

(1) The PK action helps the plastic deformation by mechanical stress under bending moment. (2) The plastic deformation by the PK action is similar to that of mechanical creep under constant loading, but not identical. (3) The deformation by the PK action is mostly plastic deformation, but there are also cases of elastic deformation.

1. Introduction

Common sense suggests that there is no mutual relationship between the spiritual and material. However, results of the development of the science of parapsychology in the Soviet Union, the United States, and other nations provides scientific evidence for the action of the spiritual on the material in the form of psychokinesis.[1,2] Recently endeavors towards the actual ultilization of this force (psychokinesis) are actively pursued, particularly in the Soviet Union.[2] However at present the type of effect pyschokinesis has on the strength of metal materials still remains unclear.

On the other hand, attempts at understanding the science of parapyschology in Japan, with the exception of certain specialists, has been exceedingly advanced, and debates over the existence or non-existence of pyschokinesis continue to appear in the mass media and other sources. That is, since February, 1974 when /Yuri Gera?/ visited Japan and the on-the-spot broadcast of the bending and breaking of a stainless steel spoon by pyschokinesis was broadcast on NTV's 11 PM (TV program) on February 25, a number of boys and girls who are said to possess paranormal abilities have come forth. Further, researchers concerned with such phenomenon have attempted to provide theoretical interpretations and suppositions concerning these from their respective positions.[3] However, since there is an intimate interdependence between psychokinesis and the minds and bodies of those possessing paranormal

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abilities, there remain many lacking apsects in terms of universality and objectivity, with the result being that there is still much active critism and resistance towards this type of phenomenon. On the other hand, since it is a fact that there are people who naturally develop or develop through religious discipline special abilities, we feel with certainty that pyschokinesis exists. Nonetheless, whether a spoon can be broken by pyschokinesis has not been witnessed under experimental conditions and further since the details of the process remain unclear, as of yet, nothing definite can be said about the phenomenon.

In this report, as a first step in the examination of such phenomenon, an experimental examination will be made into whether or not several subjects having paranormal abilities can deform a metal material (wire) using only mental thoughts and not relying on any known mechanical force, and further to examine whether or not there are any special characteristics at the time of such deformations. In other words, this report will deal with the effect of the mental state (as psychokinesis) of subjects who have the ability will be observed on a substance (the strength of metal materials) as a state of the action of psychokinesis, and this will be expressed as a graph of the curve of the relationship between mechanical force and psychokinesis.

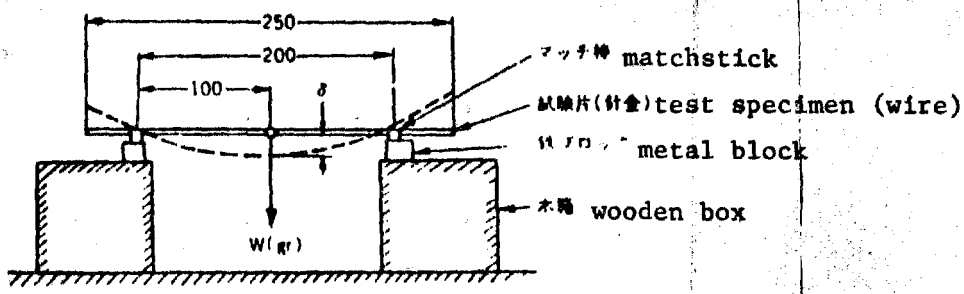
2. Experimental Method

The apparatus used in the experiment, the test specimen and the conditions of the experiment were designed and prepared by the experimenters (refer to section 2.4 below). The test subjects (refer to section 2.3 below) and their guardians exerted no influence on these factors whatsoever. Further, there were no people working under research commission in this report.

2.1 The Apparatus Used in this Experiment

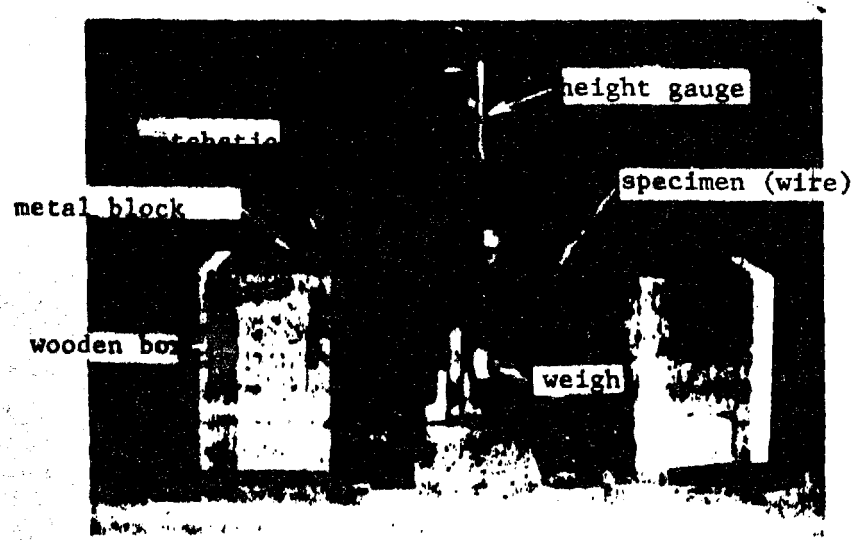
A diagram of the apparatus used in the experiment and a photograph of the apparatus are shown in diagram 1 and photograph 1 below. This was designed so that it would have an especially simple structure. The bending experiment apparatus in diagram 1 was put together on a metal laboratory table, as shown in the diagram, by placing matchsticks on top of metal blocks supported by wooden boxes and held in place using tape. A notch approximately 60 and 1 mm deep was cut into the center of the match sticks with a knife and on these was placed the test specimen which was supported in a simple beam type arrangement. The bending experiment apparatus shown in the diagram was set up on a metal laboratory table (area of the table: 600 x 1000mm, height about 750 mm, weight about 100kg). This laboratory table stood on the concrete floor of the laboratory and metal wedges were wedged between the legs and the floor to make the table horizontal and sufficiently stable. The flexure, δ (mm), shown in the diagram at the time a weight W (gr) had been applied to the test specimen was measured using a standard height gauge (a common height measuring instrument having 1/50mm calibrations which is used at machine factories). Since the test subjects stated that a covering would make the experiment hard to conduct, and further since this was the first experiment, no special covering was used. However, because of this sufficient precautions had to be taken to insure no one touched the wire during the experiments. A market sale weight (non-magnetic stainless steel) was used as the weight W (gr), which

was hung using a cotton thread, and positioned and removed from the center of the test specimen (metal wire) using tweezers. When hung on the wire the distance from the center of the weight to the center of the wire was from 50-60mm.



(第1図) 実験装置概略図

Diagram 1: A schematic diagram of the apparatus used in the Experiment



(写真1) 実験装置

Photograph 1 The apparatus used in the experiment

2.2 Experimental Specimen

The wire used in this experiment was a standard, commercially marketed wire (used to make artificial flowers) having a diameter d = 0.72 ϕ and 0.88 ϕ, a length of 1 =250 mm, a calibrated distance of 1_o = 200 mm,and was in its condition at purchase (as commercially packaged, with no special heat conditioning carried out). These were prepared by all experimenters.

2.3 Test Subjects (Persons with Paranormal Abilities)

The four test subjects who were kind enough to participate in these experiments were Kiyota Masaaki, Sekiguchi Jun, Hirota Magoto, and Yamashita [?] (age from 10-12). These test subjects and their guardians received no compensation for participating in the experiment and participated out of good will and with a positive cooperative attitude. Further, the test subjects were not previously acquinted with the experimenters. Thus, this research took place under conditions which demanded the cooperation and goodwill of strangers.

2.4 The Experimenters

The people involved in this experiment as experimenters, 17 in all, were: Ito Fumio, Ochi Yasuo, Kameda [?], Kan [?], Kurosaki Yokyu [?], Kobayashi Akira, Kobayashi Seikichi, Sasaki Shigemi, [?], Tada Kazuo, Nakamura Kazuo, Deguchi [?], Nakayama Yoichi, Fujiki Magoto, Fujihara Eiji, Hara Seiichi,and Misumi Uji. These people were all either professors, graduate students or seniors in the mechanical engineering department at the University of Electro-Communications. These experimenters had no special paranormal abilities (of the type this report deals with), liked children in general, and had outgoing (friendly) personalities. Further, although there were those in this group who had doubts concerning the exisitance of psychokinesis, there were none who outright denied the possibility of such, and all held an interest in such phenomenon.

2.5 Experimental Method

As shown in diagram 1, mechanical flexure, δ , was measured when a weight, W, was applied to the center of the wire. Next, in a position approximately 3-15 cm above the wire, the subject held his right or left palm face downward and applied psychokinsis (PK) (note 1) for time segment, t minutes (this was recorded, for example in figure 3 below, as PK 4) and the flexure, δ , was measured. In order to investigate the influence of creep (note 2), the flexure, δ , was measured for time segmant, t minutes, with the weight load applied. These measurements were carried out using the data obtained on the load process, load removal process and data previously obtained on plastic strain.

The experiment was carried out in the following order. First, prior to the start of the experiment the contents of the experiment, items of note and objective were explained to the test subjects and their guardians, and the experiment was begun after this had been completed.

Three types of experimental apparatus used in the experiment were set up in the experiment room and four experimenters, A, B,C and D were stationed at each location. The measured values taken by A were recorded by B on the prepared form shown in figure 2 (filled out for each individual experiment), while experimenters C and D and the test subjects conducted periodic checks and verifications. This report deals with the results of one of the three types of experiments conducted, however, the experiments were conducted under great care that the wire was not touched. However, in spite of the precautions exercised by the experimenters and test subjects, the wire did get touched, and when it was judged that an accidental touching of the wire had occurred, it was recorded on the records sheet and the values were removed from the experimental results obtained. In order to prevent boredom or frustration in the test subjects as a result of the monotony of the experiments, in this report the experiments were conducted using a system of periodic rotation of test subjects. Further, as concerned the progress of the experiment and in order to build confidence in the test subjects, a system of at first conducting very simple experiment conditions and then gradually moving to more complicated experiments was adopted. In other words, in diagrams 3 through 5 below, initially psychokinesis experiments were conducted using large weights, W (gr) and as the experiment progressed the psychokinesis experiments were conducted using smaller W (gr).

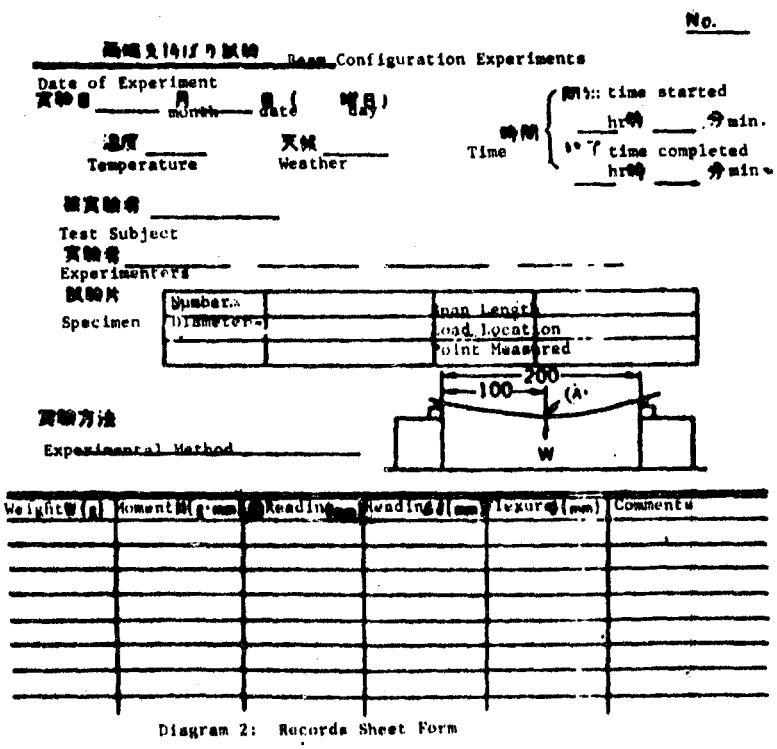


Diagram 2: Records Sheet Form

3. Results and Conditions of the Experiment

3.1 Results Obtained in the Experiment

Examples of the results obtained in these experiments is shown in diagrams 3 through 5. The verticle axis in the diagrams show weight, W (gr) and the bending monent, which is the measured flexure value, δ (mm), shown on the horizontal axis. In the diagrams, ° indicates flexure obtained through mechanical means and • indicates flexure obtained through psychokinesis. The numbers indicated in the diagrams show the elapsed time (minutes) of psychokinesis and static creep. In other words, in the diagrams, when flexure, δ , when weight W = O, is O.

First the flexure, δ (mm), was measured and recorded when W = 10 (gr) was added. With W fixed, no transformations in o following a three minute application of psychokinesis were observed (recorded as PK 3). Next, the weight was increased to W = 20 (gr) and in the same manner δ was measured and recorded as a °. Here psychokinesis was applied for four minutes, however again there was no change in δ. Next, the weight was increased to W = 30 (gr) and after pyschokinesis had been applied for an eight minute period, since a very slight flexure produced by psychokinesis occurred, this was plotted as a • and entered as PK 8. Finally, the above process was repeated using increased weights in the weight application process (the process of gradually increasing the weight) and a W- δ curve was obtained.

At this time, for example when W = 70 (gr) and creep 6 was written, this is shown by the symbol °→°, in other words, after W = 70 (gr) was measured for the corresponding flexure, after it had been left as it was (with weight still apllied) for 6 minutes at room temperature, the creep which occurs is shown by the symbol °→°. Next, while gradually decreasing the load (weight removal process) in a manner similar to that described above, a curve would then be obtained for W - δ.

On one hand in diagram 3, in contrast to °, in the measurement of •, there was a certain degree of continuity in psychokinesis or a plastic deformation δ corresponding to °→• occurred as a result of psychokinesis, or both of these occurred. Looking at the results, in the case of the W- δ curve during the weight removal process, (when W = 40 (gr) and W = 60 (gr)) there was a unique rebounding effect (appearing as elastic deformation) different from that appearing in figure 11 occurred and judging from the fact that the amount of rebound was not completely a result of psychokinetic flexure, but only a part of the process (from °→•) elastic flexure (δ rebound) along with plastic flexure (δ as a permanent deformation) can said to be included in psychokinetic flexure.

Therefore, psychokinesis, as the cause of the unique elastic deformation (rebound) mentioned above, since there is continuity in psychokinetic flexure and the plastic deformation also occurred as a result of psychokinesis, rather than •, this deformation can be judged to be a • measured value. In the diagram, assuming that there were no deformations, as will be seen in the examination in section 4 below, a smooth deformation curve, such as shown in broken lines, should be obtained, however in actuality, because

the effects of psychokinesis were included, a unique step-shaped solid line and the remarkable rebound curve obtained during load removal were obtained. These phenomenon appeared even more pronounced during the weight removal process (previously processed material). Further, it is believed these curves are unique and can not be obtained using normal mechanical methods.

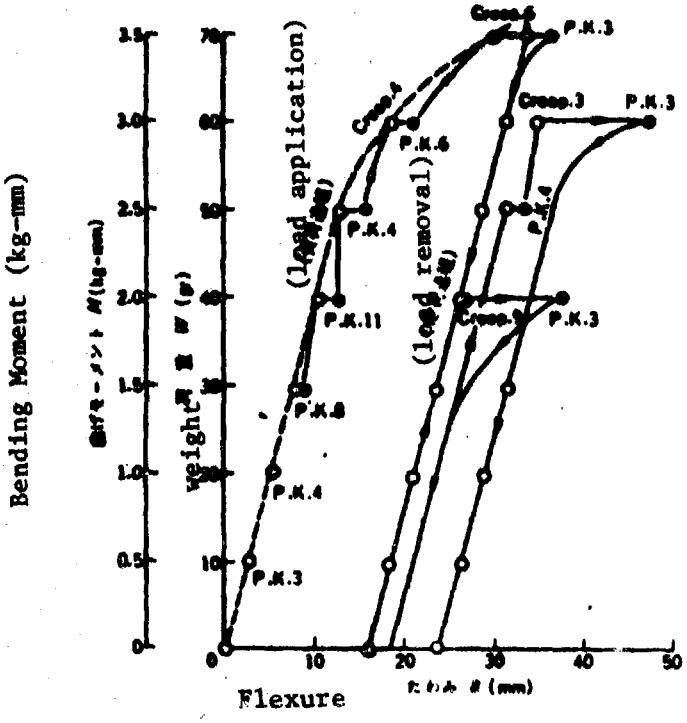


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Diagram 3: Load (bending moment)-Flexure curve; example 1

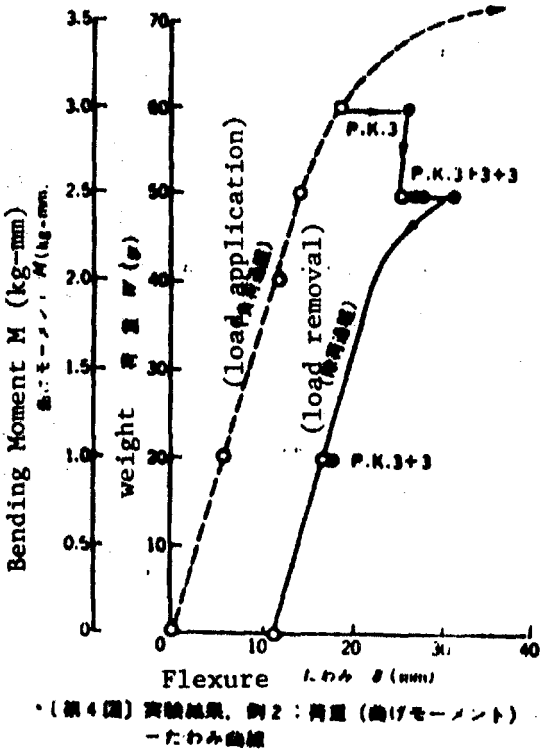


Diagram 4: Load (bending moment)-Flexure Curve; example 2

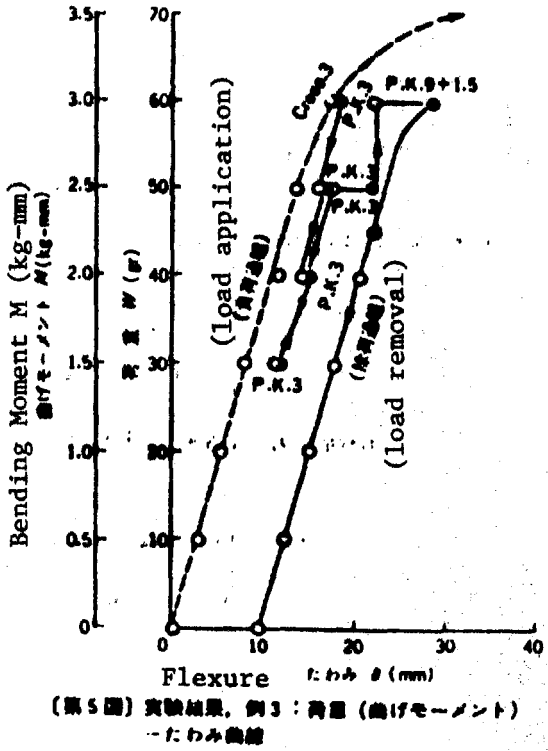


Diagram 5: Load (bending moment)-Flexure Curve; example 3

3.2 Conditions During the Experiment

Guardians and concerned persons were kept in a room adjacent to the room in which the experiments were being conducted and were cautioned not to assist in the experiments, in a mechanical sense. They were free, however to enter and leave the experiment room, sit in chairs provided, watch the experiments take place and give encouragement, however they were not permitted to become directly involved in the experiments. Further they were asked not to sit near the test subjects. The room in which the experiments took place was lighted with normal fluorescent lights which were kept at reading brightness during the experiments.

The experiments were conducted on the first or second floor experiment room at the department of mechanical engineering at the University of Electro-communication (concrete building). Standard plastic [?] tiles covered the concrete floor within the room. In front of the building there was a lawn and behind the building there were woods. The experiments were conducted four times during the period from June to September (Saturdays only). Since

on those particular days the weather was relatively clear, the glass windows were opened slightly (to a degree that the wind did not pose problems). The room was arranged in such a manner to impart a comfortable atmosphere with regard to the test subjects. In other words, during the experiment a radio was played at a low volume and household objects (bed, food utensils, comic books, newspapers, calendars and snacks) were set out.

The experiments would begin around 5 or 6 in the evening and were stopped at 10:30 in consideration of those who had to commute. The test subjects were asked to come to the campus around 4 and played games on the lawn with the students involved with the experiements for the two hours prior to the experiment. This was done because it was difficult for psychokinesis to occur for some time after having arrived. Also for this same reason, as mentioned in section 2.5, a rotation system was used and as a result, in this report no downward curve in the quality of the results obtained occurred. (note 4).

At the beginning of the experiment, the test subjects were asked not to use their hands at all and tried to deform the wire solely by concentrating on the test specimen, however this approach was not successful under these experimental conditions. Nonetheless, the test subjects and their guardians have stated that such a method has been successful when conducted in their yards.

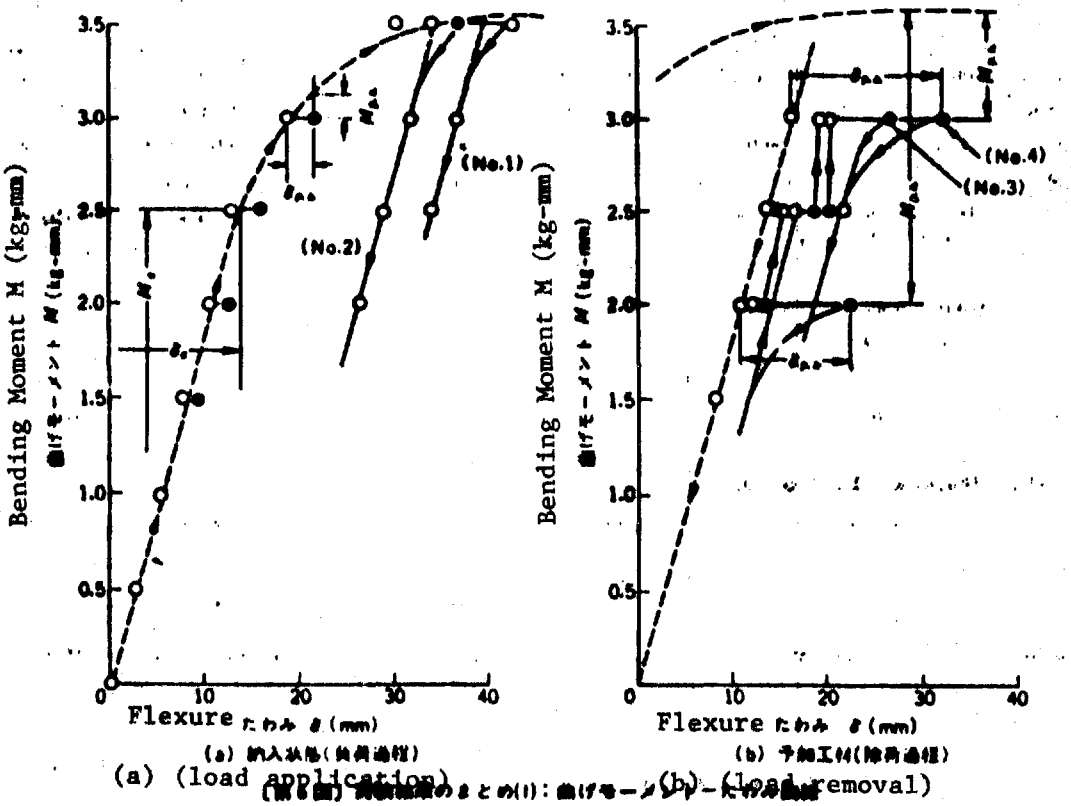
During the experiment, the test subjects were seated in designated chairs and appeared to carry out the experiments in their normal states of consciousness without relying on any special spiritual concentration. In other words, the test subjects did not carry out the experiments in a hypnotized or induced trance state. As a result, in this case, irregular breathing and weight loss were not encountered and further as far as one could judge, there were no signs of any particular fatigue observed. In the popular view, psychokinetic deformations bring up an image of remarkable deformations occurring the instant the test subject demands (just by saying "abracadabra") , however in actuality, it was usually the case that it would occur unnoticed by the test subject and would be spotted by an observant experimenter. Further, there were differences in the degree of psychokinetic deformation among individuals, however after psychokinetic deformation became possible, any number of attempts could be made with psychokinetic results. In other words, there was reproducibility in psychokinetic deformation.

Next, in order to have numerical values for the mutual realtionship between deformation by mechanical force and deformation by psychokinesis, experiment results were compiled and examined comparitively.

3.3 The Relationship between Psychokinetic Deformation and Mechanical Deformation

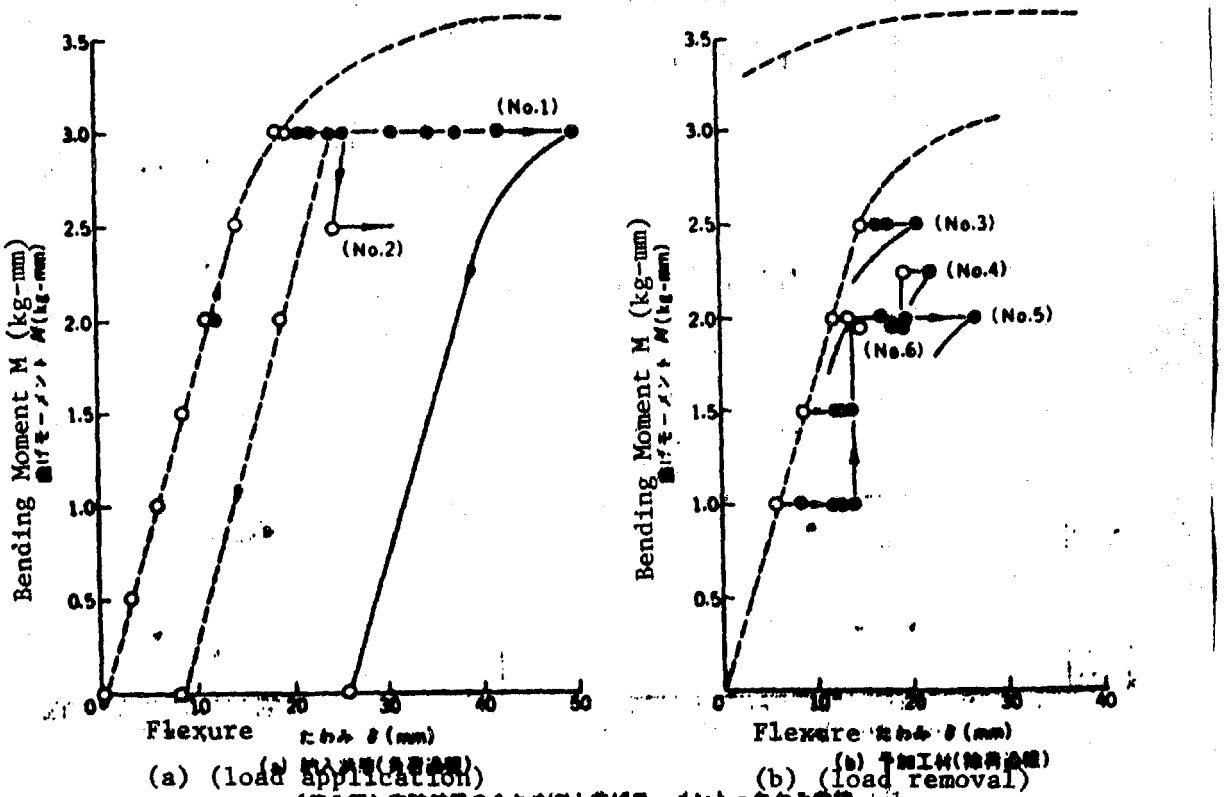
When expressing the bending moment, M, and flexure, θ , obtained from the results of the wire bending test as a curve, such curves as shown in figure 6 and 7 , for example, are obtained. In these diagrams the verticle

shows the mechanical bending moment, M, and the ° and • on the horizontal axis show mechanical and psychokinetic δ respectively. Note that the ° which are plotted away from the broken line are assumed to have been affected by psychokinesis. In the case in which there was absolutely no psychokinetic action, in general, a familiar broken line M- δ curve such as appears in figure 11 is obtained and when nearing the maximum elastic moment M_e (note 5) and when there is a M larger than M_e during the weight removal process, since flexure by psychokinesis, (shown in the diagram as δ pk) occurs, along with the step like shaped curve shown in the diagrams, it is seen that a unique M- δ curve having rebound elasticity is obtained. The δ_e indicated in the diagram is the δ corresponding to M_e. Further, δ pk is the actual value of the flexure occurring as a result of psychokinesis and since M pk replaces δ pk in the mechanical bending moment M, these are termed the corresponding psychokinetic moment and the psychokinetic moment. In other words, using mechanical means, since only flexure δ pk is obtained, it signifies that the M pk bending moment is necessary. Finally in diagram 6 and 7, the numbers (no. 1), (no. 2),...(no. 6) refer to the number of the test specimen used in the experiment (wire).



(a) (load application) (b) (load removal)

Diagram 6: Compiled results (1): Bending Moment- Flexure Curve



(a) (load application) (b) (load removal)

Diagram 7: Compiled Results (2): Bending Moment-Flexure Curve

In order to determine the conditions conducive to psychokinesis and to obtain the level of flexure caused by psychokinesis figure 8 (a) and (b) were obtained after compiling the results. In (a) and (b) in figure 8, the verticle axis show the mechanically added bending moment M and the horizontal axis shows the bending moment M pk, which was caused by psychokinesis, and the flexure, δ pk caused by psychokinesis. On both axes, in order to make it convenient to use in further comparative examinations, the respective values of the maximum elastic moment M_e and the corresponding flexure, δe are divided and expressed in a non-dimensional state as M/M_e, $\delta pk/\delta e$, and M_{pk}/M_e. In the diagram, M_e = the maximum elastic moment, M_p = the plastic moment (note 6). In the case in which the beam is a cylindrical rod $M_p = 1.7 M_e$, and in this report d=0. An experimental value of 88 ϕ mm, $M_e = 2$ kg-mm was used. Note that the obtained M_{pk} and δ pk are shown as $\circ$ in the load application process in diagram 8 and $\bullet$, in the load removal process folowing plastic deformation.

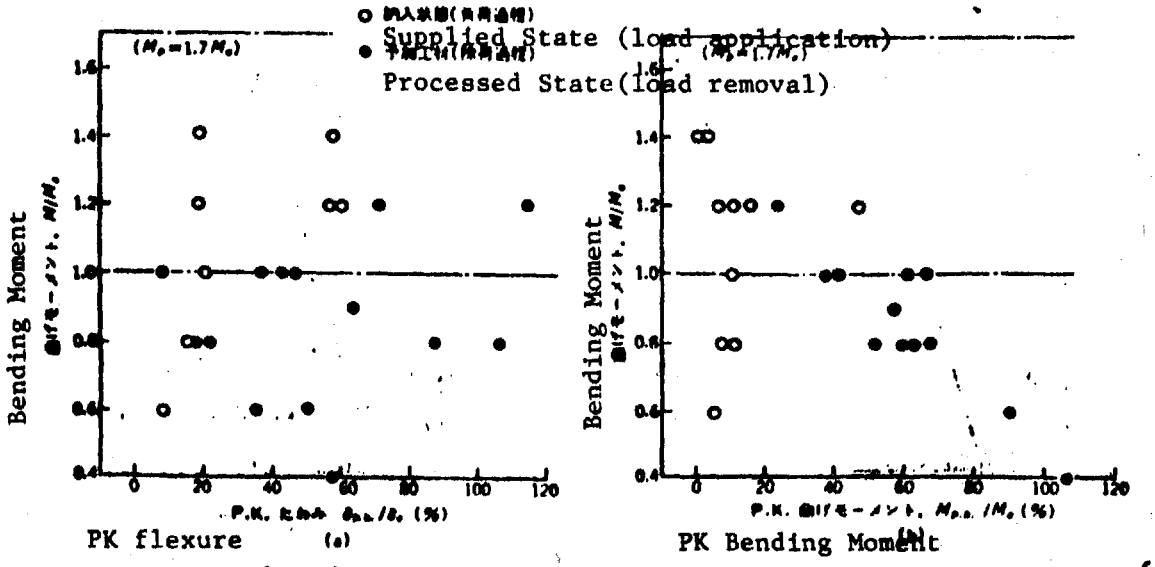
To summarize the results discussed above:

(1) In the case of the supplied state (prior to plastic deformation)

even at less than moment M_e, flexure δ pk appears as a result of psychokinesis, and in the case where bending moment M is $M > 0.6\ M_e$, there is a tendency for the larger the M the larger the δ pk.

(2) In the case following plastic deformation (processed state) for M where $M > 0.4\ M_e$, when $M = M_e$, there is a tendency for a maximum δ pk to appear (maximum value is δ pk/ δ e = 110%, where δ e is the δ coreesponding to M_e).

(3) The psychokinetic bending moment M_{pk} corresponding to the supplied state, even when M was larger than M/M_e = 60% were roughly the same and M_{pk}/M_e = 10 %, however , in the load removal process and the processed state M_{pk} when M was larger in range than M/M_e = 40 %, M_{pk} had a tendency to decrease the larger the M. The maximum value of M_{pk} in this case when M/M_e = 40 %, was M_{pk}/M_e = 100%.



(第6図) P.K.たわみ及びP.K.曲げモーメントと曲げモーメントの関係

Diagram 8: The Relationship between Bending Moment and PK Flexure and PK Bending Moment

4. Examinations of the Results Obtained

4.1 Creep Deformation and Psychokinetic Deformation

Within the stress range of fluid stress (note 7), it appears that creep occurs in a mechanical and dynamic sense. First let's examine the relationship between creep deformation and psychokinetic deformation. Creep deformation was pronounced in the case of cantilever type bending experiments[6]. For the purpose of the examination, a mechanical or dynamic creep curve was drawn for a stress larger than the yield stress, which is shown in figure 9 (a) and (b). In other words, the graph shows flexure δ (mm) on the verticle axis and time (minutes) on the horizontal axis. The results obtained in the experiment have a tendency to correspond with known primary creep, transitional creep and logarithmic creep[7] occurring at generally low stress and low temperatures. Examples of the results for the examination of the relationship between normal dynamic creep and psychokinetic deformation are shown in figure 10 (a) through (d).

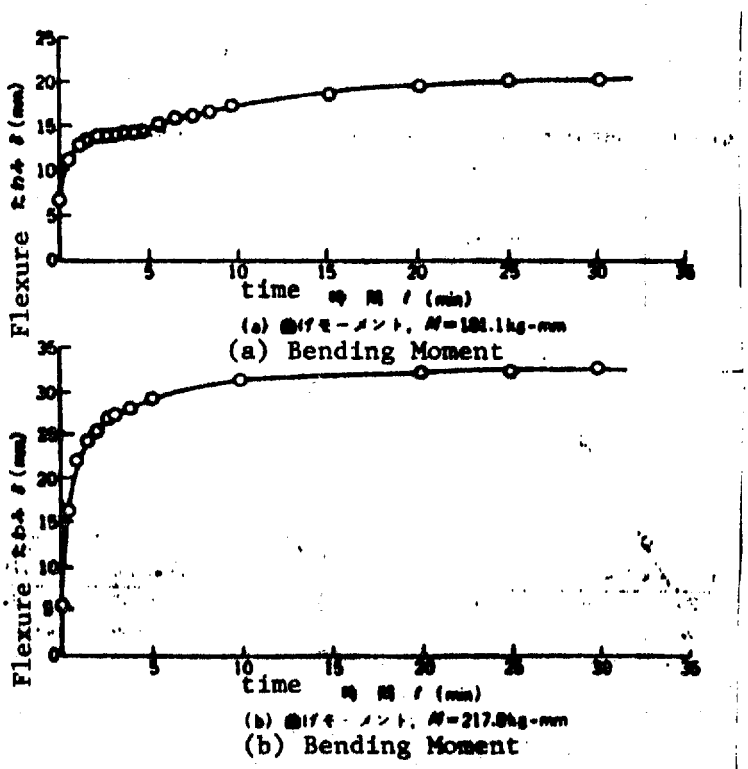


Diagram 9: Flexure- Time Relationship (Dynamic Creep Curve)

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(a) and (b) show the case of simple beam structure bending experiments while (c) and (d) show cantilever structure bending experiments. In (a), (b), and (d) in the diagram, ° and • show mechanical (creep) and psychokinetic flexure respectively. °→• shows the case of deformation by psychokinesis, •→• shows flexure caused by creep, °→° shows the case of continued creep, while •→• is the case of continued pyschokinesis. °→• in (c) show δ pk caused by a person with paranormal abilities, while °→° shows the δ caused by a normal person conducting the same actions as the person with paranormal abilities (refer to section 2.5 Experimental Method). Comparing figures 9 and 10, there are clear differences in both these cases. In other words, the dynamic creep curve in figure 9 is relatively gentle, however the flexure caused by psychokinesis in figure 10 is broken. Looking at figure 10, only when psychokinesis was occurring could a sudden increase in flexure be observed (for example •→•).

In the study above, the following results were obtained:

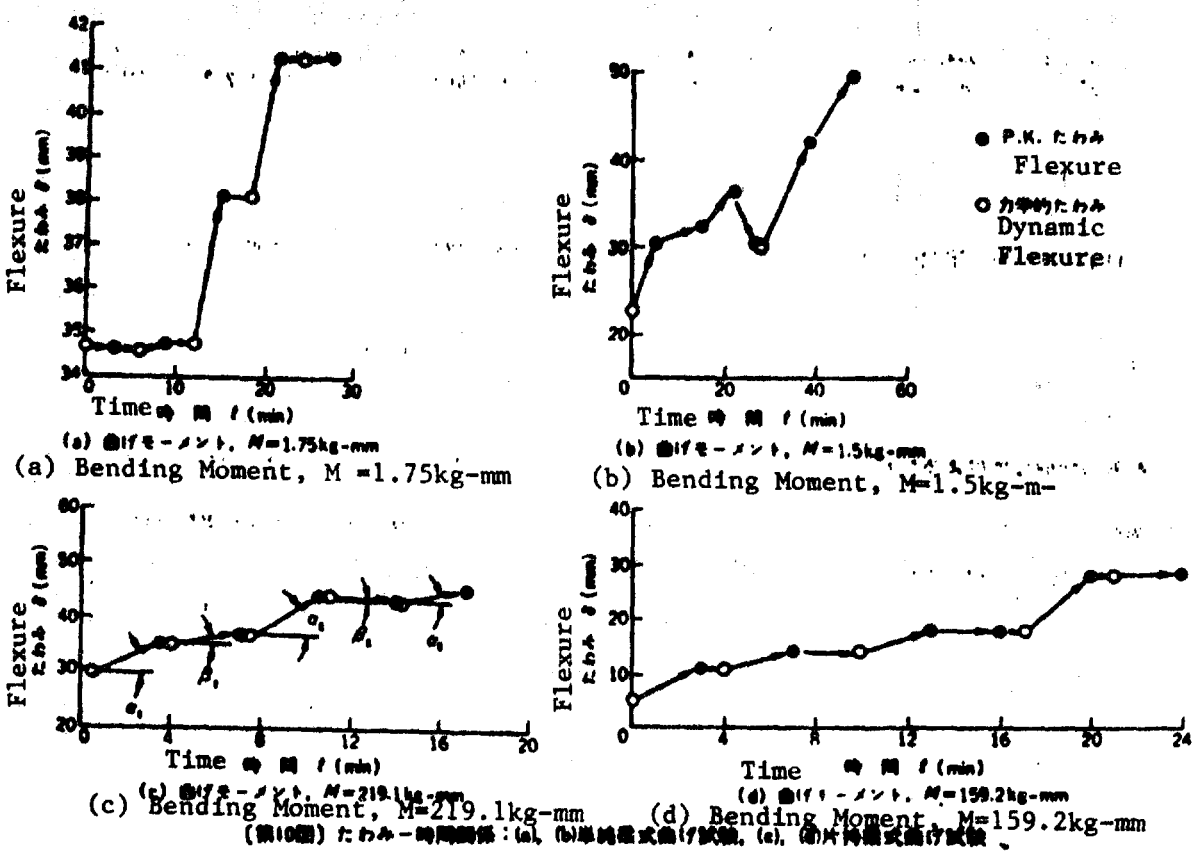
(1) δ pk resembles creep deformation, but is not identical.

(2) within δ pk a rebound effect (for example the decreasing δ •→° in figure 10 (b)) occurs.

(3) δ pk appears for only an instant (δ was only observed for the time note at the experiment point in the graph, and the time up to that point was not measured.)

4.2 Deformation by Dynamic Force

An example of the results obtained in the experiment are shown in figure 11 (a) and (b) in order to examine the relationship between flexure δ pk which is caused by psychokinesis and flexure caused by dynamic force. These results show the case in which a normal person carried out the same experiment as had been carried out by persons having paranormal abilities using the same experimental apparatus as shown in figure 1. When both cases are compared, it is noted that as the major difference, that in diagram 11 (a) and (b) a step-shaped deformation and rebound as seen in diagrams 3 through 5 did not occur. Further, diagram 11 (a) and (b) show a standard M- δ curve, therefore, the δ pk and rebound explained in figure 3 and 6 above, can be assumed to be the appearance of a phenomenon caused as a result of psychokinesis.



(a) Bending Moment, M =1.75kg-mm (b) Bending Moment, M=1.5kg-m-

(c) Bending Moment, M=219.1kg-mm (d) Bending Moment, M=159.2kg-mm

Diagram 10: The Flexure- Time Relationship. (a) and (b): simple beam structure bending test; (c) and (d) cantilever type bending test

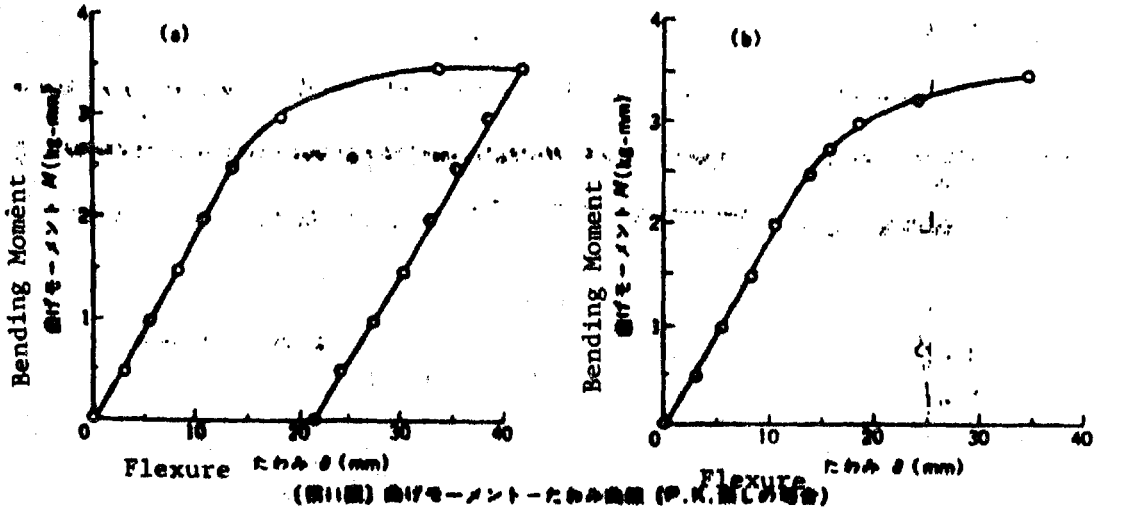


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Diagram 11: The Bending Moment-Flexure Curve (no psychokinesis)

5. Conclusions

The following conclusions were obtained from the results of the experiments described above:

5.1 Conditions Conducive to Psychokinetic Actions

(1) Psychokinetic results appear within the range at which a metal nears or passes yield stress. In other words, psychokinesis is more likely to occur in cases which are also conducive to creep.

(2) Psychokinetic results appear at stress levels below the yield stress levels of materials (within the range of elastic stress) that have undergone prior plastic strain.

5.2 The Relationship between Psychokinetic and Dynamic Strength

Indicated effects of psychokinesis on the dynamic and mechanical properties of materials are believed to be on the stress rate, flexure rate, and power. However, due to a lack of experimentation at present, on which factor it has a maximum effect remains unclear.

(1) The progression of dynamic plastic deforamtion aids the action of psychokinesis.

(2) Deformation caused by psychokinetic action is usually plastic deformation, but there are some cases of elastic deformation

(3) Plastic deformation caused by psychokinetic action resembles creep deformation under constant stress, however it is not identical.

From the above, it can be said that plastic deformation caused by the action of dynamic force aids psychokinetic actions. In other words, if a small force is added and psychokinetic action is included, it is believed that the plastic deformation would advance even more remarkably (observed comparison).

5.3 How Psychokinesis Appears

(1) The instant psychokinesis occurs, plastic deformation is aided (advanced).

(2) Deformation progresses as a result of psychokinetic action, however it can be assumed that after action has stopped, some continuity is maintained and continues to operate.

(3) The appearance of psychokinetic action have no special relationship to public observation.

(4) According to information given by the test subjects (those having paranormal abilities) there are periods when psychokinetic actions can be

strong or weak and there are periods when it occurs easily and those when it is more difficult. However, within the scope of this report, psychokinetic actions had reproducibility.

In the results above, only a small part of the effects of psychokinetic actions on the strngth of materials were examined experimentally. Further, even within the narrow field dealt with in this report, since there are so many unknown factors in relation to psychokinetic actions, there can be no clear results until further studies are carried out.

A special characteristic in the above experiments has been the test subjects, guardian, and experimenters successful completion of these experiments.

6. Expression of Gratitude

From our hearts we would like to thank the positive cooperation of those involved in these experiments, and the patience of the test subjects and their parents in what was surely a tiring experience.

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Notes

note 1 PK is used as an abreviation of psychokinesis.

note 2 Within the transformation of plastic deforamtion occurring over time, when a constant load is applied to a material, the increased plastic deformation is termed creep . Plastic deformation refers to non-reversible permanent deformation.

note 3 In the simple beam structure (wire) shown in diagram 1, the maximum bending movement, M, at work at the center of the wire was calculated to be M = (W/2) x 100 (kg-mm).

note 4 This refers to the downward performance and reults curve that occurs with repetition over a long time period.

note 5 In the wire bending experiemnts, the bending movement M at the time the maximum stress within a cross section reaches the yield stress σ y is the maximum elasticity moment M e. In stress σ strain ε curves in the case of tension tests, σ y is the slight bending stress shown by plastic strain ε_p (about 0.2%). Stress σ y is normally σ = P/A when P is weight and A is the original area A. Strain ε , when $\Delta\ell$ represents the stretch, and ℓ is the original length, $\varepsilon = \Delta\ell/\ell$. Further $\Delta\ell$ in the case of plastic stretch (permanent deformation) ε is the plastic strain ε_p .

note 6 In the central region of the simple beam shown in diagram 1, a weak layer within the cross section of the neutral surface remains, and the overall plasiticity at the cross section is refered to as the bending moment M p. In the neutral surface, stress σ, occurring on the beam as a result of the one-directional beding moment M, when σ = 0 and tension stress is transformed into compressive stress, passes the core of the rod (metal). Further the region of plascitity is that region where plas ic (permanent) deformation occurs. [?]

note 7 Yield stress is termed o y. A stress larger than o y is fluid stress. In other words, when fuid stress is o f, o y o f. The relationship between bending moment M and bending stress o , can be shown as σ = M y/ I where y is the distance from the neutral axis (M=0), I is the secondary sectional movement, and in the case of the cylinderical rod, $I = \pi d^4/64$ (d = diameter).

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