THE APPLICATION OF GROUP CONTINGENT REINFORCEMENT
TO HOSPITALIZED ADOLESCENTS

THESIS

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Fifteen hospitalized adolescents were used as subjects. An individually conseuated token economy was in effect during baseline. Measures were taken of work output, attending behavior, and disruptive behavior. During the treatment phase, reinforcement was contingent upon the performance of a randomly selected subgroup. Following the treatment phase, the individual token system was reinstated for baseline-2 measures.

The mean performance of the group during baseline was compared to performance under treatment conditions for work output and attending behaviors. In addition, performance of the contingent subgroup was compared to performance of the non-contingent group. No significant t values were obtained. With failure to obtain significant t values, the null hypothesis was not rejected, i.e., the two conditions were not proven significantly different.
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THE APPLICATION OF GROUP CONTINGENT REINFORCEMENT 
TO HOSPITALIZED ADOLESCENTS

The effectiveness of manipulating contingencies of reinforcement to modify behavior has been demonstrated time and again. Whether it is called behavior modification, behavior management, contingency management, or "applying the rod to avoid spoiling the child," the basic principle remains the same. Systematic manipulation of the relationship between behavior (response) and pay-off (reinforcement) affects the behavior in more or less predictable ways.

There are many variables which affect the outcome of such manipulation. Among them are properties of the present and the desired response (such as complexity and operant level), type of reinforcers and their availability, and susceptibility of the situation to systematic manipulation. Any statement of relationships between behavior and consequences, and attempts to apply the principles to modify those relationships must account for at least these variables.

The present study is an investigation of one system which provides a framework for the modification of the contingency relationships. It has been used with a wide variety of behaviors from simple (Sulzbacher & Houser, 1968) to complex (Packard, 1970). This system has been used to increase
the rate of desired behaviors (Willis & Crowder, 1972) or decrease disruptive ones (Axelrod, 1973). The use of simple, inexpensive, easily administered reinforcers has been shown possible within this system (Barrish, Saunders & Wolf, 1969). It also appears applicable to a wide variety of situations from the classroom (Gallagher, Sulzbacher & Shores, 1967) to the hospital (Arizpe, 1973).

In group contingent systems of behavior management, reinforcers are applied to all members of the group consequent to the emission or non-emission of target behaviors by individual members of the group. Thus group contingencies are differentiated from individual contingencies in terms of the application of the reinforcers. This system of reinforcement provides advantages in administrator time and fullest utilization of a minimum number of reinforcers. A review of some of the current trends in the manipulation of contingencies to manage behavior should provide a perspective from which to view the efficacy and applicability of group contingent reinforcement.

A considerable amount of research has been done concerning the use of contingency management for the modification of the problem behaviors of children. From the standpoint of childhood psychopathology, many successful attempts have been made to modify behavior. Such problems as bedwetting (Wickes, 1958), nightmares and sleepwalking (Clement, 1970), lack of social behaviors (Patterson & Brodsky, 1966),
even poor spelling (Zimmerman & Zimmerman, 1962) have been effectively handled.

In the above procedures, the operating contingencies of reinforcement are examined and subsequently modified for one individual. In such a way the reinforcer which has been maintaining the maladaptive behavior is eliminated and perhaps replaced by reinforcers of other more profitable behaviors. This is a gross oversimplification, but should suffice as a starting point for the present inquiry.

Such research into practical applications is valuable in its applicability to individual problems. There is a need, however, to broaden the base of the research, making it available to the treatment of a wider range of problems and larger numbers of individuals (Baer, Wolf & Risely, 1968). As Bushell, Wrobel and Michaelis (1968) have indicated:

In most group situations it is not practical to program individually special contingencies for the responses of each member. Uniform criteria must be designed according to which a number of individuals are to be rewarded or punished.

It is not enough that experimenters are able to eliminate undesirable behaviors in individuals. They must also be able to apply the principles to groups (e.g. the classroom and the hospital), making the application more feasible to the social system as a whole (Quay, Werry, McQueen & Sprague, 1966).
The first step in moving from individual behavior management to group management is to determine what reinforcers will work effectively. In a classroom setting Madsen, Becker and Thomas (1968) compared the effects of (a) rules without systematic consequation, (b) ignoring inappropriate behavior, and (c) ignoring such behavior while applying positive consequences to appropriate behavior. Not surprisingly, three things were found. Rules alone were clearly insufficient. While ignoring of inappropriate behaviors (extinction) seemed to be a step in the right direction, the key to maintaining desired behavior was the positive reinforcement of it.

What are positive reinforcers? Undoubtedly the more profitable approach is to empirically test potential reinforcers rather than attempt to define the term. In a class of low track English students, the teacher's application of social reinforcers successfully reduced talking and turning-in-seat behaviors (McAllister, Stachowick, Baer & Conderman, 1969). Quay et al. (1966), however, point out the importance of using something more concrete when attempting to influence the behavior of individuals with conduct disorders. Using a light affixed to each student's desk (the light was later associated with the awarding of candy), attending behaviors were increased.

Maloney and Hopkins (1973) achieved better creative writing performances in children in fourth through sixth
grades by making additional recess time contingent upon use of increasingly complicated writing behavior. Thus simple, readily available and inexpensive means are potentially able to influence comparatively complex behaviors.

In any situation in which individual behaviors of group members are to be uniformly manipulated, the simplest and perhaps the most popular system is the token economy. A token economy is a procedure in which the behaviors to be modified are continuously monitored within the scheduled environment (Ingham & Andrews, 1973). In the token economy the desired behaviors are "paid-off" with some object which has no intrinsic value. Such objects, the tokens, are more easily handled than the more reinforcing objects for which they are later exchanged. The tokens, then, provide more flexibility and make application of the system possible in a broader range of situations.

The effectiveness of tokens has been shown through many research applications. In decreasing undesirable classroom behavior, Dietz and Repp (1973) effectively reduced "talking-out" behavior in trainable mental retardates and eliminated subject changing behavior in normal, high school girls. O'Leary and Barker (1967) used tokens to eliminate disruptive behavior and increase adaptive behavior in a classroom of seventeen "emotionally disturbed" children.

Tokens were used by Wolf, Giles and Hall (1968) in a remedial program in summer school. Bushell et al. (1968)
used them with preschool children, and Birnbauer, Wolf, Kidder and Tague (1965) with retarded subjects. In all cases, tokens effectively increased the rate of desirable behaviors in the classroom. Birnbauer and his associates, however, noted that of their fifteen subjects, only four returned to pre-token economy levels of disruptive behavior when tokens were removed from the system. The authors suggest that careful experimental inquiry is necessary in each new case to determine the nature of the operating contingencies.

Moving out of the classroom, tokens have been used effectively to reduce stuttering behavior (Ingam & Andrews, 1973). Using a very innovative procedure involving measurement of percentages of stuttered syllables, the stuttering behavior of thirty-nine adult males was reduced with token pay-offs. Zifferblat (1972) used tokens effectively in a state mental hospital occupational therapy program. With severely retarded hospitalized children tokens effectively eliminated maladaptive behavior (Perline & Levisky, 1968).

In the above instances it has been shown that through the establishment of group standards followed by reinforcement of individual adherance to those standards, behavior of individuals can be modified. Thus by reinforcing individual members for their emission of uniform, desired behaviors, whole groups can be controlled.
Moving from individual behavior control through group behavior control by monitoring individual behaviors, the logical next step is to maintain desired behavior in groups by monitoring only selected individuals. In such a situation the entire group is reinforced on the basis of the behavior of these selected individuals. This is the situation observed in our above definition of group contingent systems. This system has been shown to compare favorably with individually contingent reinforcement paradigms in numerous situations. Long and Williams (1973), and Arizpe (1973), experimentally compared the group contingent systems with individually contingent ones.

The usefulness of such a system of reinforcement in controlling behaviors should be assessed along several dimensions. Does it allow optimal use of available reinforcers? Does it allow optimal use of controller time and effort, and thus leave the teacher, unit director, or psychologist free to deal with other matters? Is it applicable to a wide range of behaviors? Is it applicable in a wide range of situations?

The first two questions above have been answered with experimental evidence giving affirmative answers. As Arizpe (1973) has shown, if the individuals monitored are the lowest producing ones in the group and all members of the group are reinforced at this low rate, behavior is effectively maintained at a minimum expense in reinforcers. In terms
of controller time, much can be saved if only a small percentage of group members need be monitored, and subsequent application of reinforcers to the group members is uniform.

Group contingent reinforcement has been shown to be applicable both in reducing disruptive behaviors and in increasing adaptive behaviors. One of the earliest attempts to measure group contingent phenomena (Gallagher et al., 1967) eliminated out-of-seat behavior in a classroom. Sulzbacher and House (1968) used recess time to eliminate "naughty-finger" behavior. Any instance of "naughty-finger" by any class member cost the entire class two minutes of play time. Disruptive behaviors in a fourth grade class were eliminated by making two teams compete for best behavior awards (Barrish et al., 1969). The noise level of second and fourth grade classes was reduced effectively by Schmidt and Ulrich (1969) using group contingent reinforcers. Axelrod (1973) eliminated disruptive behaviors in a special education classroom using a group contingent system.

Increases in desired behavior were achieved by Packard (1970) and Willis and Crowder (1972). Both experimenters increased attending behaviors. Packard used a token system and Willis required a given amount of attending behavior, measured in terms of time. In the Willis study, a movie at the end of the day was contingent upon a minimum amount of attending behavior of all class members. Good study behaviors
and high productivity of accurate work were achieved by Long and Williams (1973).

The question of applicability of group reinforcement of a broad range of settings is not yet fully answered. Most research on group contingent reinforcement has been done in the classroom. Arizpe (1973) successfully applied group contingent reinforcement to forty chronic psychotic patients in a state mental hospital. In his procedure the subjects were participating in an exercise program. Comparing the effects of moderately systematic social reinforcement (Baseline), individually contingent token reinforcement and group contingent reinforcement, Arizpe found that both types of token reinforcement were more effective than social reinforcement. There was no significant difference between the subject's performances under group or individual consequation.

With one exception, all of the studies noted above used a similar method of applying contingencies. Each group member was monitored for emitting undesirable behaviors or for failure to engage in the desired behavior. In such situations, any occurrence of the undesired behavior was followed by the application of aversive conditions to the entire group. Group members were avoiding the loss of a reinforcer, not behavior to receive it. In light of the complications involved in the use of aversive consequences, a serious weakness of such applications is apparent.
One study (Arizpe, 1973) used positive reinforcement, applied to the whole group and contingent upon the behavior of only a few members of the group. It was found that such a system is as effective in controlling behaviors as individually contingent systems. The implications of such a system offer an important area for further research.

One difficulty in Arizpe's study revolves around the role of awareness of the contingency. If, for example, subject A were not a member of that sub-group whose behavior is being monitored, then his own performance has no effect upon the number of tokens which he receives. Thus "A" need not perform well (or at all) and yet he will receive reinforcers. Were Arizpe's chronic psychotic patients aware of such a possibility? If so, would it influence the rate of the desired behavior?

The effect of the knowledge that a subject's own performance is irrelevant to the amount of reinforcement received had been unmeasured. The use of adolescent subjects, most of whom were diagnosed as character-disturbed, as drug abusers, or as having adjustment reactions, was proposed to determine what effect awareness of the contingency would have upon the behavior.

The present study concerned itself with a comparison of a group contingent system of reinforcement with an individually contingent system. Unlike most of the research in this area, reinforcement, not the avoidance of aversive
conditions, was contingent upon group behavior. Unlike the Arizpe study, the subjects of this investigation were fully aware of the contingency in effect. The null hypotheses are

I. There will be no difference in the work output of the subjects under the two contingency systems.

II. There will be no difference in the attending behavior of the subjects under the two contingency systems.

Method

Subjects

Fifteen adolescent patients of a state mental institution (thirteen males, two females) were used as subjects. All had been participating in the hospital's special education program prior to the initiation of the experiment. The mean age of the group was sixteen years, nine months. The age range was from nine years, ten months to twenty years, one month. Army Beta IQ's ranged from 58 to 93 with a mean of 77.1. All subjects had attended some public school. All had done very poorly. None had completed high school.

Three subjects had been diagnosed as acute schizophrenic reactions. Two of these evidenced good contact at the time of the study. One showed fair contact. One member of the class who demonstrated poor reality contact was not included in the study. Of the remaining twelve subjects, ten had various combinations diagnoses which included adjustment reactions to adolescence, drug abuse, and anti-social
personality disorders. Two subjects had no diagnosis. Of the fifteen subjects, four evidenced signs of mild organic involvement, not severe enough to warrant special treatment, but considered contributory to the primary problem. Diagnoses were made by the unit director, a master's level psychologist, on the basis of a standard intake interview and test battery.

Apparatus

The subjects were reinforced with tokens. The tokens were small (three inches by one inch) oblongs of plastic. The tokens had been in effect in the classroom for several months prior to the experiment. They were exchanged at the end of each class period for candy, cigarettes, or small trinkets.

A stop-watch was used to measure time intervals for attention behavior monitoring. All subjects worked in programmed mathematics workbooks. This series of workbooks had been in use in this program for over a year prior to the experiment.

Scoring and Reliability

Two aspects of the subjects' classroom behavior were measured as dependent variables. Work output was measured in terms of the number of pages of the workbook completed without error. Attending behavior was measured at two-minute intervals during the thirty minute class period (providing
for fifteen checks of attending behavior per class period). A student was considered to be attending if he was (a) working on a page in his book, (b) waiting quietly with hand raised for the teacher to check a completed page for accuracy, (c) conversing appropriately with the teacher concerning work in progress, or (d) erasing a finished page before continuing to the next. Any other behavior was considered not attending and was so recorded.

The rater sat at the rear of the class with the stopwatch, observing the class, remaining as inobtrusive as possible. Upon completion of a correct page (one work unit), the teacher acknowledged such to the rater, and a notation was made next to that student's name on the score sheet. At the end of two-minute intervals, each member of the class was observed for attending behavior. Any student who was not attending to the lesson received a mark, noting this fact on the score sheet.

Disruptive behaviors were noted but remained under individual consequation by the teacher, using the system in effect over the previous six months. Since disruptive behavior could have a deleterious effect upon work output and attention, measurement was necessary to assess any such effect.

Reliability was checked by means of a second rater. The second rater sat at the opposite end of a long table from the experimenter. Using the same form and procedure,
the second rater noted work units and attending behaviors by each class member's name. Also noted were disruptive behaviors for the class as a whole. Only one stop-watch was used. The experimenter made a sign (which could not be observed by the members of the class) and both raters independently observed and noted attending behaviors. The second rater participated in four of the experimental sessions.

**Procedure**

Prior to baseline 1 the experimenter sat in the rear of the classroom for several class periods. This procedure prevented spurious effects which might have resulted from the novelty of an unfamiliar person in the classroom.

**Baseline 1.**--The baseline 1 condition was the standard individually contingent token economy which had been in effect in the classroom for several months prior to the experiment. The teacher announced the beginning of a thirty-minute work period and each subject immediately began working independently in his (or her) workbook. Upon completion of a page, the subject raised his hand and waited quietly for that page to be checked. The teacher or her aide, using an answer key, checked the page for completeness and accuracy. If the page was 100 percent accurate, the student was awarded one token and a liberal amount of social reinforcement from the teacher (or aide). If the page was not complete or not 100 percent accurate, no token was awarded.
In such a case, the teacher might attempt explanation of the material or might only identify the incorrect item before moving on to another student.

At the end of each two-minute interval the teacher surveyed the class, assessing each individual's attending behavior. Due to conflict resulting from the teacher's immediate involvement in checking work output, the intervals ranged from about 1.5 minutes to about 2.5 minutes. There were always fifteen such intervals, however, in each thirty-minute class period. Any student attending at these checks received one token. Any student not attending received no token.

Baseline 1 measures were taken for one week. All class members were fully aware of the contingencies in effect during the baseline phase.

**Treatment.** During the treatment phase of the experiment, all members of the class received both work output and attending tokens uniformly. Three members of the class were chosen randomly at the beginning of each day's class to be labeled as the contingent sub-group. Each member of the class was to maintain behaviors identical to their baseline behaviors and measures of work output and attention remained the same. The following instructions were read to the class by the teacher at the beginning of each work period during the treatment phase:
Today we are going to award tokens a little differently. Everyone will receive tokens on the basis of what . . . (members of the contingent sub-group were named) do. When two of them finish a page, everyone will receive a token. If two of them are attending to the lesson at the two-minute checks, everyone will receive a token. Are there any questions? Open your books and begin working.

The last sentence in this introduction had become the teacher’s standard way of announcing the beginning of a work session.

Work output tokens were awarded to all members of the class after completion of a 100 percent accurate page by two of the three contingent sub-group members. Each student continued to raise his hand and have his work checked. Now, however, no tokens were awarded and no praise was given individually. Tokens and praise were awarded to the whole class, contingent upon the randomly selected sub-group.

Similarly, an individual's behavior was irrelevant to the award of attending behavior tokens. If two members of the contingent sub-group were attending at the two-minute checks, all individuals received tokens. Thus an individual might receive a token at a time when he was clearly not attending.

The treatment conditions were in effect for two weeks following baseline 1.

Baseline 2.—Following the application of the group contingency, the class was returned to the original individually conseqauted token system. Each subject was again
awarded tokens contingent upon his own work output and attending behaviors. Baseline 2 measurement was in effect for one week.

Results

Reliability

Pearson product-moment correlations were computed to assess the reliability of the observations made. For each of four days, the experimenter's data was paired with a second observer's data for each subject's performance on each of the two measured variables. A Pearson r was computed for these pairings. For attending data the correlations ranged from .922 to .962 with a mean correlation of .947. The mean correlation for work output observations was .995. The range was from .991 to .998. The high correlations obtained suggest that the observed behaviors were sufficiently well defined to allow relatively accurate measurement.

The Dependent Variables

To compare the subjects' performance in the individually contingent system with their performances in the group contingent system, t tests for matched groups were computed. The mean of the baseline period was compared to the mean of the treatment period.

A t value of 2.145 was necessary to achieve significance at the .05 level (McNemar, 1969). The t values of the work
output and attention behavior are shown in Table 1. There were no statistically significant $t$ values obtained. The subjects' performances on both dependent variable measures, attention and work output, were not significantly different under the two contingency systems. Figures 1 and 2 offer graphic illustration of the daily averages of work output and of attention behavior respectively.

Table 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (Baseline)</th>
<th>Mean (Treatment)</th>
<th>$t$ Value</th>
<th>Significance Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Output</td>
<td>8.759</td>
<td>8.096</td>
<td>1.002</td>
<td>NS*</td>
</tr>
<tr>
<td>Attending Behaviors</td>
<td>14.481</td>
<td>13.506</td>
<td>1.414</td>
<td>NS</td>
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</table>

*denotes non-significance at the .05 level

As a measure of the effect of membership in the contingent subgroup, $t$ tests were again computed. These tests compared the performance of the contingent subgroup to those subjects who were not in the contingent subgroup. Means were computed for each subject for performance while (1) in the contingent subgroup and (2) not in the contingent subgroup. Then the means of the group performances under the two conditions were compared. The results of this test are
Fig. 1--Work Output
Fig. 2--Attending behavior

ATTENDING BEHAVIOR CHECKS

TWO-MINUTE

15 14.5 14 13.5 13 12.5

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 (B2)
shown in Table 2. No significant $t$ values were obtained, indicating that members of the contingent subgroup did not perform significantly differently from those subjects who were not part of that subgroup.

Table 2
Comparison of Performance of Contingent Subgroup and Non-Members of the Contingent Subgroup

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean Non-Contingent Group</th>
<th>Mean Contingent Group</th>
<th>$t$ Value</th>
<th>Significance Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Output</td>
<td>8.207</td>
<td>7.774</td>
<td>.744</td>
<td>NS*</td>
</tr>
<tr>
<td>Attending Behaviors</td>
<td>13.94</td>
<td>13.12</td>
<td>1.767</td>
<td>NS</td>
</tr>
</tbody>
</table>

*denotes non-significance at the .05 level

In comparing the disruptive behaviors of the subjects during baseline and treatment procedures, means and a $t$ test were computed. The mean daily number of disruptions for the baseline period was 2.25. The daily mean of disruptions during treatment was 2.75, with a $t$ value of .463. This $t$ value was non-significant at the .05 level, and suggests no significant difference in disruptive behaviors. Thus any difference in the two dependent variable measures is not likely to be a result of increases (or decreases) in disruptive behaviors.
Discussion

The results substantiated the hypotheses since it was demonstrated that there was no statistically significant difference in the subjects' performances during the different reinforcement contingencies. Thus it has been shown that reinforcement for all group members which is contingent upon the adequate performance of only a few members can maintain desired behavior in hospitalized adolescents.

Before any hypothesis can be elevated to the status of a conclusion, however, it must be demonstrated that the experimental procedure used does not possess built-in methodological faults (Heath, 1972). It may be that something other than the token system maintained the behavior of the subjects throughout the experiment. If this were the case, manipulation of the contingency for earning tokens would have, perhaps, little effect upon the measured behaviors. Although no clear-cut, overt social reinforcers were administered to the subjects on the basis of individual performance, the procedure for checking subjects' work output contained some potentially potent covert reinforcers. The necessity of the teacher's personally checking each completed page could have been reinforcing to the subjects.

The personal attention may have been paired sufficiently with tokens, over the preceding months, that it had become a secondary reinforcer. Figures 1 and 2 reflect a
progressive decline in performance. If the experiment had continued for several weeks, it is possible that statistically significant differences would have become evident. It is possible that the subjects' histories of participation in the individually consequated system resulted in more than one secondary reinforcer.

As mentioned previously, none of the subjects had been successful in public schools. Under the greater control of the small classroom situation and the consistancy and predictability of the token system all were successfully progressing in their workbooks. Therefore, the classroom used in the present study could not accurately be equated to most school classroom situations.

Research should be designed which could account for those variables mentioned above, which were demonstrated in the present study. Longer studies are needed to account for the effect of possible secondary reinforcers. Studies should be done in which the teacher is not so personally and immediately involved in reinforcing the desired behavior. Group contingent techniques should be used in more usual classrooms (i.e., public school classrooms) and other group situations (such as hospitals and even industrial settings). It is only through experimental application that the usefulness of group consequated reinforcement systems can be assessed in the myriad of possible applications (Baer, et al., 1968).
Thus, while the null hypotheses are not rejected, more research is needed to determine the precise functional relationship between individually contingent reinforcement systems and group contingent reinforcement systems. Also, greater control of the various sources of individual reinforcement is needed before a system can be called truly group contingent. Only then can any definite relationship be called factual.

Summary

Fifteen adolescent patients of a state hospital were used as subjects. The subjects had been participating for several months in a token-reinforced special education class in mathematics. Baseline measures were taken of (1) the subjects' work output in 100 percent accurate pages completed in programmed workbooks, (2) attending behaviors of the subjects and (3) disruptive behaviors. Under baseline conditions, subjects were reinforced on the basis of individual performance.

During the treatment phase, subjects were reinforced on the basis of the performance of a randomly chosen subgroup of subjects, rather than on the basis of individual performance. Measures were taken, during treatment, of the same three aspects of the subjects' behavior as were taken during baseline. Following the treatment phase, the original individually contingent system was reinstated and baseline 2
measures taken of work output, attending behaviors, and disruptive behaviors.

To compare the effects of the two contingency systems, $t$ tests of the means of the baseline and treatment performances were computed. Additional comparison was made, using $t$ tests, of the performance of the contingent subgroup and non-contingent group. No $t$ values were obtained which were significant at the .05 level. Thus it was found that there were no significant differences in the two reinforcement systems in the present study.

Reliability of the experimental observation was checked by a second rater. The second observer's ratings of the two dependent variables were paired with the ratings made by the experimenter. Pearson product-moment correlations of the pairings were computed. High correlations were found for both dependent variables, suggesting relatively accurate observations.

The possibility that the observed productive behavior of the subjects was the result of covert individual reinforcement was discussed. The possibility of uncontrolled covert reinforcement prevents concluding that the two systems of reinforcement are definitely equally effective in maintaining desired behavior. Some possible sources of covert reinforcement and means of overcoming such reinforcers experimentally were discussed.
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