Affective and metabolic responses to hypnosis, autogenic relaxation, and quiet rest in the supine and seated positions

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AFFECTIVE AND METABOLIC RESPONSES TO HYPNOSIS, AUTogenic RELAXATION, AND QUIET REST IN THE SUPINE AND SEATED POSITIONS

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University of Wisconsin–Madison

Abstract: This study examined the influence of hypnosis, autogenic relaxation, and quiet rest on selected affective states and metabolism. The influence of body position (seated vs. supine) on these same outcome measures was also investigated. Anxiety, tension, and overall mood were assessed before and 30 minutes after each treatment, and oxygen uptake was measured continuously. State anxiety, tension, and a general measure of mood were reduced significantly following each intervention, but oxygen uptake did not change with the exception of small, transient alterations during the physical challenges performed in the hypnosis condition. It is concluded that administration of a routine hypnosis induction to healthy individuals results in a reduction of state anxiety and an improvement of mood commensurate with effects achieved by autogenic training and quiet rest, and these effects occur in both the supine and seated position.

Quiescent modalities such as meditation, hypnosis, and various relaxation procedures have gained in popularity with the search for alternative interventions in areas such as medicine, wellness, and health psychology. Relaxation, hypnosis, and meditation treatments are often viewed as minimal or passive treatment conditions in such research, whereas quiet rest has been conceptualized as a control or placebo treatment. This can be problematic, because participants in these “passive” groups are often found to differ from the intervention group (e.g., drug, exercise, psychotherapy) in a number of ways that are recognized. There is also the possibility that such group comparisons involve differences that are not recognized. This is a particular problem when quasi-

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experimental designs (Campbell & Stanley, 1963) are employed, and this occurs when randomized-groups designs are not possible.

The use of "passive" treatments can lead to further complications, because these interventions have been shown to be capable of producing both psychological (e.g., reduced anxiety) and physiological (e.g., reduced blood pressure) effects (Morgan, 1997). The members of a control group should be treated the same as members of an experimental group except for the independent variable (e.g., hypnosis) that is being manipulated. This is often instructive because control groups sometimes experience significant outcomes, and these effects occasionally equal those seen in the experimental group. Therefore, the question should not be whether or not an experimental intervention has an effect, but rather the issue should be the degree to which the outcome observed following the experimental treatment exceeds that of a placebo and a no-treatment control.

It has been reported that state anxiety, as measured by the State-Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch, & Lushene, 1983), can be reliably decreased following noncultic meditation, as well as "quiet rest" (i.e., control). It has also been reported that cardiovascular (Deabler, Fidel, Dillenkoffer, & Elder, 1973; Raglin & Morgan, 1987) and endocrine (Michaels, Huber, & McCann, 1976) changes can accompany such interventions. Indeed, it was reported by Michaels et al. that although transcendental meditation was effective in reducing plasma levels of epinephrine, norepinephrine, and lactate, the effect was just as great following a control period of "quiet rest." In order to assert that hypnosis, meditation, or relaxation reduces physiological arousal or improves affective states, it is imperative that contrasts be made between such interventions and the mere passage of time in a quiet setting.

There is one additional methodological issue that has been largely ignored in this area. It has been accepted that various relaxation procedures are most effective in the supine position (Benson, 1975; Jacobson & Baucom, 1977; Schultz & Luthe, 1969), and some investigators believe that the individual's physical posture is very important during the induction of hypnosis. Newman (1979), for example, has indicated that tense adults "... sometimes feel very threatened in the recumbent position, and children especially often dislike lying down, presumably because of association with bedtime" (p. 287). Nevertheless, there is an absence of compelling empirical research demonstrating that body position (e.g., seated versus supine) has an influence on outcomes when these interventions are employed. It is possible, of course, that various physiological effects attributed to relaxation procedures are simply the result of alterations in body position. In addition, there does not appear to be systematic research dealing with the influence of body position (seated versus supine) on affective outcomes.
The primary purpose of this investigation was to evaluate the influence of autogenic relaxation, hypnosis, and quiet rest on selected affective states and oxygen uptake. A secondary purpose of the study was to evaluate the influence of body position (seated versus supine) on these same outcome measures.

**METHOD**

*Participants*

Forty-five healthy individuals with a mean age of 21.5 years ($SD = 3.5$) were evaluated in one of three conditions consisting of hypnosis ($n = 15$), autogenic relaxation ($n = 15$), and a control procedure involving quiet rest ($n = 15$). A quasi-experimental design (Marascuilo & Serlin, 1988) was employed to ensure adequate training in the experimental procedures (i.e., autogenic relaxation and hypnosis) compared with outcomes in a control group involving quiet rest. It was not feasible to randomly assign participants to the relaxation and hypnosis groups because the former were required to possess mastery of autogenic relaxation and the latter to score high on hypnotizability.

*Independent Variables*

The participants in the relaxation group consisted of student volunteers who had previously completed a relaxation class based on the autogenic method (Schultz & Luthe, 1969) taught at the University of Wisconsin–Madison. This class met twice a week for 15 weeks, and only students who received a letter grade of A in the class were eligible to take part in the study. Participants in the control and hypnosis groups were recruited by means of flyers posted in various buildings on the University of Wisconsin–Madison campus. Volunteers for the hypnosis condition were initially screened using the Harvard Group Scale of Hypnotic Susceptibility (HGSHS; Shor & Orne, 1962), and those individuals scoring seven or higher on the HGSHS took part in further testing. Hypnotic susceptibility was further evaluated using the Barber Suggestibility Scale (BSS; Barber, 1965a), and all participants scored above the 70th percentile on both the objective and subjective portions of the BSS. These screening procedures minimized variability on hypnotizability and insured an adequate depth of hypnosis for the purposes of this investigation.

*Dependent Variables*

The dependent variables in this investigation consisted of state anxiety as measured by the Y-1 scale of the STAI (Spielberger et al., 1983), tension as measured by the Profile of Mood States (POMS) (McNair, Lorr, & Dropplemann, 1992), and the overall or total mood score yielded by the POMS. Oxygen uptake was measured using a Rayfield Metabolic Inter-
face System (REP-400), and expired air was collected by means of a Rudolph Nasal and Mouth Breathing Mask. The REP-400 Data Acquisition System includes a hardware and software interface that serves to integrate metabolic signals that are transmitted to an IBM computer in order to automate the continuous collection of data. More complete details of this system were described earlier by Wang and Morgan (1992).

Procedure

Participants in this investigation were randomly assigned to a starting date, and they were asked to report for testing on two separate occasions during the same 1-week period. An interval of at least 24 hours existed between sessions. The testing was carried out while participants rested quietly in an environmental chamber maintained at a sound level of 8 dB, temperature of 72° F (±2°), and a relative humidity of 45% (±10%). Individuals completed the autogenic relaxation, hypnosis, or control condition in the seated or supine position on the 2 test days. The order for body position was counterbalanced and randomly assigned to participants. An easy chair was employed for the seated condition, and a padded examination table along with a padded headrest were used for the supine condition. The time of day was held constant for the testing of each individual, and the testing conditions involved 30 minutes of either guided autogenic relaxation, hypnosis, or quiet rest. Participants in the relaxation condition listened to a guided relaxation tape based on the autogenic method (Schultz & Luthe, 1969), and individuals in the hypnosis condition received a tape-recorded induction based on a modified version of the Stanford Hypnotic Susceptibility Scale, Form C (SHSS:C; Weitzenhoffer & Hilgard, 1962). Participants were asked to follow the tape-recorded instructions as closely as possible to insure consistency across conditions and individuals. Participants in the control condition were asked to close their eyes, rest quietly, and remain awake.

A Panasonic M40 VHS video camera with a shotgun microphone was directed at the participant, and each session was recorded onto Sony L-750 videocassettes using a Panasonic HQ VHS videocassette recorder. It was not necessary to disqualify any participant in this study due to overt signs such as excessive body movements or snoring, nor did any participant report that he or she slept when queried during the debriefing session following the treatments. The video camera was focused on the participant throughout, and the recording provided an image of the individual’s head, upper body, arms, and hands.

The research protocol was approved by the appropriate Institutional Review Board at the University of Wisconsin–Madison, and participants read and signed an informed consent statement at the outset of the study. Participants were informed that the investigation was concerned with the psychological and physiological effects of various interventions, but they were not given explicit information that might generate
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expectancies. Upon arrival at the laboratory, participants completed a 24-hour history dealing with physical activity, dietary, and sleep patterns, as well as a self-estimate of general well-being in order to identify reasons why a given individual might need to be rescheduled for another day. Rescheduling was only necessary in three cases. Loss of sleep the previous night was the reason in one case, and transient physical complaints in the other two. Participants next completed the Y-1 subscale of the STAI (Spielberger et al., 1983) along with the POMS (McNair et al., 1992) in order to obtain measures of state anxiety (STAI), tension (POMS), and overall mood (POMS). The computation of a total mood score was achieved by adding the scores on the POMS subscales that carry a negative valence (T+D+A+F+C), subtracting the one score that carries a positive valence (V), and adding a constant of 100 to avoid negative scores. The instructional set for completion of both the STAI and POMS directed participants to respond in terms of "how you feel right now at this moment."

Once the questionnaires were completed, the participant entered the sound chamber and assumed either a seated or supine position. The breathing mask was positioned on the individual, and this was followed by a 5-minute period of adaptation so that participants could become accustomed to the testing environment. This period of acclimatization was followed by 30 minutes of hypnosis, autogenic relaxation, or quiet rest. Following this 30-minute intervention, the mask was removed, and the individual completed the STAI and POMS once again with the same instructions employed prior to the session. This was followed by a debriefing session that was used to evaluate the individual's general reactions to the session. This included a question as to whether or not the individual thought they had fallen asleep during the session. None of the participants included in this analysis reported that they had fallen asleep, and a review of the videotapes did not reveal body movements or sounds that were suggestive of sleep. All participants were then provided with a copy of the STAI, POMS, and a stamped, self-addressed envelope with the request that the questionnaires be completed 60 minutes after debriefing and mailed as soon thereafter as possible. The post-debriefing questionnaires were received within 24 to 48 hours via first class mail service or returned to the lab in person.

RESULTS

Descriptive statistics were computed for all of the dependent variables, and this was followed by a series of three-way analyses of variance (ANOVAs) with repeated measures across the trials factor to test for statistical significance (Kirk, 1982). An an a priori alpha level of .05 was employed in this study, and a Fisher LSD post hoc was utilized to probe for the location of mean differences where a significant F value was observed.
The state anxiety, tension, and overall mood data are summarized in Table 1, and the ANOVA results revealed that none of the $F$ values were significant for the group (hypnosis, autogenic relaxation, quiet rest) or position (supine, seated) conditions, nor were any of the interaction effects significant. However, there was a significant trials effect for each of the affective measures. The resulting $F$ values across time for state anxiety, $F(2, 84) = 40.8, p < .0001$; tension, $F(2, 84) = 33.7, p < .0001$; and overall mood, $F(2, 84) = 17.7, p < .001$, were each significant. Post hoc analyses revealed that state anxiety, tension, and overall mood was reduced significantly at 5 minutes following each intervention. These affective changes persisted for at least 1 hour, the point at which the final assessment was made.

Oxygen uptake was expressed in relative terms as milliliters per kilogram of body weight per minute (ml·kg$^{-1}$·min$^{-1}$), because this approach has the advantage of controlling for differences in body size. The means and standard deviations for the oxygen data are summarized in Table 2. The ANOVA results revealed a significant group effect, $F(2, 42) = 5.81, p < .006$, trial effect, $F(5, 210) = 7.15, p < .0001$, and a group by trial interaction, $F(10, 210) = 5.94, p < .0001$. Post hoc analyses of the interaction effect revealed that oxygen uptake increased significantly ($p < .001$) for the hypnosis group at minutes 15 to 20 of the induction, compared with the steady state values observed at minutes 5 to 10 and 25 to 30.

**DISCUSSION**

The results of this investigation revealed that state anxiety, tension, and overall mood state improved significantly following relaxation, hypnosis, and quiet rest, and these affective changes were independent of body position. The finding that anxiety is decreased following relaxation and hypnosis is consistent with the earlier reports of Herbert and Gutman (1983) and Paul (1969). Furthermore, this study extends earlier research to include the issue of body position, and outcomes were found to be similar in the seated and supine positions. These findings differ from the earlier report by Benson (1975) indicating that the effects of relaxation and hypnosis are best realized in the supine position. The present study provides empirical evidence showing that reduced anxiety and improved mood states are not influenced by the body position (seated versus supine) in which one performs autogenic relaxation, hypnosis, and quiet rest. It should also be noted that quiet rest resulted in the same degree of affective improvement as did autogenic relaxation and hypnosis, and these results are consistent with earlier reports by Bahrke and Morgan (1978) and Raglin and Morgan (1987), who reported similar reductions in anxiety following noncultic meditation, aerobic exercise, and quiet rest. These findings have been interpreted to mean that distraction from the cares and worries of the day afforded by both passive (e.g., meditation, relaxation, quiet rest) and active (e.g., aerobic exercise)
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*p < .001 (Epoch 15-20 higher than Epochs 5-10 and 25-30 for the hypnosis condition).
interventions can have a positive influence on affect in individuals scoring in the nonclinical range on anxiety. There has been a tendency to view the "distraction" explanation as a psychological rather than a physiological hypothesis, but it is more appropriate to interpret this observation within a psychobiological context because quiet rest and meditation (cultic and noncultic) are associated with cardiovascular and endocrine changes, as well as self-reported anxiolysis (Bahrke & Morgan, 1978; Michaels et al., 1976; Raglin & Morgan, 1987).

The mean oxygen uptake did not decrease significantly during the three interventions employed in the present study, but there was a significant increase in oxygen uptake during a portion of the hypnosis condition when psychomotor challenges were presented to the participants. The hypnosis group experienced a significant increase in oxygen uptake during the 5-minute period when the individuals in this group performed physical tasks, such as hand clapping and arm rigidity. Isometric muscular contractions of this nature should produce increased oxygen uptake, and this is precisely what resulted. However, when participants in the hypnosis condition were at complete rest (i.e., no psychomotor challenge), the steady state oxygen uptake did not differ from that observed for participants in the autogenic relaxation and quiet rest conditions. These results demonstrate that instrumentation of the type employed in this study possesses the precision necessary to detect small changes in oxygen uptake.

The earlier literature dealing with efforts to identify physiological correlates of hypnosis failed to yield conclusive evidence (Gorton, 1949; Barber, 1965b; Crasilneck & Hall, 1959; Levitt & Brady, 1963; Morgan, 1985; Weitzenhoffer, 1963). A review of this earlier literature does not permit generalizations or advancement of principles, and Levitt and Brady (1963) pointed out that many of the physiological changes attributed to hypnosis may simply reflect muscular relaxation or drowsiness. This is another reason why a no-treatment control needs to be included in research designs concerned with the efficacy of interventions such as hypnosis, meditation, and relaxation.

It is also important to recognize that most hypnosis researchers today are not investigating the effects of hypnosis per se, but rather they are attempting to study the effect for a specific task done during hypnosis. This is quite different than making a case for a broad-based hypnotic state that is characterized by unique patterns of brain activity irrespective of what the hypnotized person is doing (Kirsch & Lynn, 1999, Ray et al., 2000). It is now recognized that physiological parameters assessed during hypnosis are most likely to change or be responsive when a specific task or challenge is employed. It has been shown, for example, that perception of effort is remarkably similar during bicycle ergometry performed at a resistance of 100 watts under control and hypnosis conditions. However, suggestions of uphill and downhill exercise result in
significant increases and decreases respectively in both metabolism and effort sense (Morgan, 1985). This finding has recently been replicated and extended with imaging techniques to demonstrate that regional cerebral blood flow (rCBF), heart rate, and blood pressure also vary with hypnotic perturbation of effort sense during exercise (Williamson et al., in press). In other words, there is an absence of compelling data supporting the view that hypnosis per se influences those physiological variables that historically have been measured, and this general finding continues to be confirmed with advances and applications involving neuroimaging (Crawford, Knebel, & Vendemia, 1998; Williamson et al., in press).

An exception to the above generalization is the report by Rainville et al. (1999) dealing with regional cerebral blood flow (rCBF) and electroencephalographic (EEG) responses during hypnosis. These investigators reported that decreases in rCBF were observed in selected brain regions with hypnosis alone, and “hypnosis with suggestions produced additional widespread increases in rCBF in the frontal cortices predominantly on the left side” (p. 110). The investigators interpreted these results as providing “... a new description of the neurobiological basis of hypnosis” (p. 110), as well as support for a state theory of hypnosis. These views serve to contradict much of the contemporary hypnosis literature, and the findings should be viewed with caution for a number of reasons. It was reported by these investigators that “the suggestions did not contain any direct reference to muscle relaxation/tension” (p. 120), and because the SHSS:A was modified to include a “fist lock” (p. 119), it is possible that the effects attributed to hypnosis were, in fact, due to the alert or active nature of the induction. Isometric contractions (e.g., fist lock) can lead to significant cardiovascular and endocrine changes, and, because this procedure was not employed in the baseline or control procedure, it would be misleading to suggest that the observed effects were due to a special state resulting from hypnosis.

Although each of the interventions was associated with a significant reduction in state anxiety lasting for at least 1 hour, the three interventions did not differ in the magnitude of this anxiolytic effect. These findings are in agreement with earlier reports in which noncultic meditation and quiet rest produced comparable reductions in state anxiety (Bahrke & Morgan, 1978), and transcendental meditation has been reported to have physiological effects similar to those observed following quiet rest (Michaels et al., 1976). It has also been reported by Raglin and Morgan (1987) that quiet rest is just as effective as vigorous physical activity in reducing both state anxiety and blood pressure. Hence, there is psychometric, cardiovascular, and endocrine data supporting the efficacy of quiet rest as a method of reducing stress markers (e.g., anxiety, catecholamines, and blood pressure). These results demonstrate that generic hypnosis and autogenic relaxation have similar effects and these
outcomes do not differ from those associated with quiet rest. It is possible that current-day advances in technology, particularly functional magnetic resonance imaging (fMRI), positron emission tomography (PET), and single photon emission computerized tomography (SPECT), may be effective in demonstrating that hypnosis, meditation, and various relaxation procedures have effects that extend beyond those observed for quiet rest.

The results of this investigation are consistent for both the supine and seated positions. There have not been compelling theoretical rationales advanced for the efficacy of a particular body position, nor has there been systematic research on this subject. The present findings are important because test protocols sometimes dictate that a supine or seated position be employed, and the absence of effects due to body position is fortuitous in this regard. It is not uncommon for institutional review boards charged with the evaluation of research proposals involving human participants to employ various restrictions and safeguards in connection with research involving the use of hypnosis. The findings of this study demonstrate that, at least in its most standardized and routine applications (e.g., the Stanford Scales), administration of hypnosis procedures has outcomes that are similar to those observed following a nonhypnotic procedure involving quiet rest.

The generalizability of these findings should be restricted to individuals scoring in the normal range on the affective measures employed in this study, and it is possible that these effects cannot be generalized to anxious individuals. Indeed, there is evidence that some anxious individuals actually experience increased anxiety and panic attacks during and following exposure to various relaxation procedures (Borkovec, 1985). It is particularly important that our findings of reduced anxiety following quiet rest be evaluated with individuals scoring high on state anxiety. Our findings indicate that, among healthy individuals, administration of a routine hypnosis induction with no other special suggestions for alteration in experience, mood, or physiology, results in a reduction of state anxiety and an improvement of mood, which is commensurate with effects achieved by autogenic training and quiet rest. These effects occur in both the supine and seated positions.

REFERENCES


HYPNOSIS, AUTOGENIC RELAXATION, AND QUIET REST


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Résultats: La présente étude a examiné l'influence de l'hypnose, de la relaxation autogène, et du repos silencieux sur les états affectifs choisis et le métabolisme. L'influence de la position de corps (assis contre en supination) sur ces mêmes mesures de résultats a été également étudiée. L'inquiétude, la tension, et l'humeur globale ont été évaluées avant et 30 minutes après chaque traitement, et la consommation d'oxygène a été mesurée sans interruption. L'état d'inquiétude, la tension, et une mesure générale d'humeur étaient sensiblement réduits à la suite de chaque intervention, mais la consommation d'oxygène n'a pas varié, sauf de petits changements passagers observés pendant les exercices physiques exécutés dans l'état d'hypnose. On conclut qu'effectuer une simple induction d'hypnose à des sujets sains entraîne une
réduction de l'état d'inquiétude et une amélioration de l'humeur proportionnée aux effets entraînés par la formation autogène et le repos silencieux et que ces effets se produisent en position en supination et assise.

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Resultados en el metabolismo y la ansiedad con la hipnosis, la relajación autógena, y el descanso

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Resumen: Este estudio examinó la influencia de la hipnosis, la relajación autógena, y el descanso en estados emocionales particulares y el metabolismo. También investigamos la influencia de la posición corporal (sentada vs. yacente) en estas mismas medidas. Evaluamos la ansiedad, la tensión, y el estado general de ánimo 30 minutos antes y después de cada tratamiento, y medimos continuamente el consumo de oxígeno. Después de cada intervención, el estado de ansiedad, la tensión, y el estado general de ánimo se redujeron significativamente, pero el consumo de oxígeno no cambió a excepción de alteraciones transitorias pequeñas durante las pruebas físicas en la condición de hipnosis. Concluimos que la administración de una inducción hipnótica de rutina en individuos saludables resulta en una reducción del estado de ansiedad y una mejora en el estado de ánimo, similares a los efectos logrados por el entrenamiento autógeno y el descanso, y estos efectos ocurren tanto cuando las personas están sentadas como acostadas.

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