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Purchase Patterns affected by Budget Spending Rules

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Abstract

The efficient spending of public money is a matter of social concern. In the regulations of many countries, at the end of fiscal year, the unused budget "expires" and the remaining money is returned to the treasury, with the budget for the following year possibly reduced. In response, people in their spending capacities tend to use up the remaining budget towards the end of the year, in a "use it or lose it" mentality. Here we reproduce this "end-of-year spending binge" in an experiment, where subjects tend to spend excessively towards the end of fiscal year. We show that by modifying the budget rule so that the remaining money is "carried over", the excessive spending can be significantly curbed. Our results suggest that experiments in the laboratory can be used to study people's budget spending behavior and identify factors that affect wasteful overspending, potentially helping design financial rules that encourage effective use of budget.

Introduction

In many countries, budget authority requires the agencies to spend funds by the end of the fiscal year or return them to the treasury [1]. Under such a regulation, there are two potential losses for the spending agency if some portion of the budget money remains unspent at the end of the fiscal year. The spending agency would suffer from the missed opportunity to spend the money, regardless of the value of items and services thus purchased. In addition, there is the risk that future budgets will be reduced, based on the judgment that unspent money represents a lack of need [2]. In fact, legislators tend to regard end-of-year surplus as an excuse to cut future budgets [3].

These circumstances lead to the likelihood that the spending agencies would resort to low-value spending, as the opportunity cost for end-of-fiscal year spending is close to zero. Specifically, it is expected that the agent would spend more amount of money towards the end of the fiscal year ("overspending"), while the quality of the items purchased would become lower towards the end of the fiscal year ("inefficiency").

There is empirical evidence to suggest that expectations about overspending and inefficiency towards the end of fiscal year are actually the case. Using data on all U.S. federal contracts from 2004 through 2009, Liebman and Mahoney. "Do Expiring Budgets Lead to Wasteful Year-End Spending? Evidence from Federal Procurement." National Bureau of Economic Research Working Paper 19481) found that spending spiked in all major federal agencies during the 52nd week of the year, as the agencies rushed to exhaust the expiring budget authority: The spending in the last week of the year was 4.9 times higher than the rest-of-the-year weekly average. They also found that the average project quality fell at the end of the year. Quality scores in the last week of the year were 2.2 to 5.6 times more likely to be below the central value. Thus, actual data seems to suggest the existence of both overspending and inefficiency.

The tendency to overspend at the end of the fiscal year serves the short-term interests of the spending agent, as it reduces the amount of money lost from budget expiration. From the viewpoint of community interest (representing the stockholders and taxpayers in the private and public sectors, respectively), wasteful year-end spending undermines efficient money spending. In the context of principal-agent problem [4,5], the efficient spending of budget is a case where the spenders of budget money (agent) are supposed to be acting in the best interests of taxpayers or stockholders (principal). The problem is that the agent's actions do not necessarily align with the interests of the principal. The government agency, as the agent, may indulge in a wasteful end-of-year overspending, resulting in a misalignment with the intentions of legislative officials as the principal [6,7]. It is thus of scientific and practical interest to understand how the overspending behaviors occur in the face of the possible budget surplus, and if possible, how to curb them.

There are at least three possible causes for the end-of-year overspending. One is the fact that the budget would expire and the spending agent would lose the opportunity to spend it. The second is the potential reduction of the budget in the next fiscal year due to the budget surplus. The third cause, uncertainties in the purchase parameters, is indirect but potentially significant: Due to the uncertainties in circumstances pertaining to the execution of budget, the spending agent might be motivated to reserve some money towards the end of the fiscal year, preparing for "a rainy day". The extra cash available at the end of the fiscal year would then nurture proneness for overspending. In the real world, spending behavior occurs in a complex and opaque environment, where it is often difficult to identify the factors contributing to the overspending behavior. In addition, it takes at least a few years to evaluate how a change in budget regulations would affect people's budget spending behavior. It is therefore beneficial to have experiments where the wasteful year-end spending could be reproduced.

Here we report a reproduction of the wasteful year-end spending in an experiment. We used sweets available on the Japanese market

to represent the items purchased in a typical office environment. In Japan, as in many countries, it is common for office workers to pool some money to buy sweets to be consumed in the office during the working hours. The expenditure is often subsidized partially or fully by the budget, so that the idea of buying sweets using the budget money is familiar for the majority of subjects.

In the experiment, we represented one fiscal year with 12 spending opportunities in the laboratory, each opportunity representing one month. The subjects had the option to select and purchase n ($0<=n<=4$) sweets out of four candidates randomly chosen from a reservoir of 10 kinds of sweets commonly available in the Japanese market. After the 12th month, the unused budget either was confiscated (in the "expire" condition) or carried over (in the "carryover" condition), to represent different financial regulations. We analyzed the spending behavior of subjects, comparing the two conditions. We have successfully reproduced the end-of-year spending binge (overspending and inefficiency) in the experiment.

Method

There were two experimental conditions. In the "expire" condition, the amount unused "expired" and was returned to the budget reservoir at the end of experiment. 12 subjects (8 males and 4 females, age average=31.4, standard deviation=9.7) participated in this condition. In the "carryover" condition, the amount unused was "carried over", and eventually given to the subjects at the end of experiment. 12 subjects (7 males and 5 females, average age=35.5, standard deviation=6.6) participated in this condition. There was no overlap of subjects between the two conditions.

After a briefing on the general aim and plan of the experiment, the subjects were given 2000 yen each. The nature of the two conditions (expire and carryover) assigned to each subject was explained at the beginning of the sessions in a technical manner, with no reference to the end-of-year spending binge problem, and without mentioning the nature of the alternative condition. The passage of one fiscal year was represented by 12 buying opportunities, each representing one month. The months were expressed as "Month 1", "Month 2", etc., to avoid any implications of seasonality, which may affect the subjects' purchase behaviors. The subjects were instructed to imagine that they were buying the sweets for the sake of themselves and co-workers in an office. The nature of the enterprise (public or private) was not mentioned explicitly.

There was no clock to time the transactions and progress of months. The experiment proceeded with a natural pace. One session typically required about 10 minutes. The progress of months was thus metaphorical in nature.

Each month, the subject had the option of buying (or not buying) n ($0<=n<=4$) out of the 4 items randomly chosen and presented from a battery of 10 kinds of sweets (Figure 1). Actual sweets were presented and handed to the subjects at the time of purchase. The sweets were familiar brands widely available in Japan. The designated prices of the sweets were identical to their market values, ranging from 100 yen to 200 yen (4 items priced at 100 yen, 2 items at 130 yen, and 4 items priced at 200 yen). With each transaction, the subjects paid out with real money, and were given the merchandise and change. The purchased items were physically handed to the subjects by the experimenter. In the event of the subject running out of money before the 12th month, the protocol was to keep asking the subject if he/she wanted to buy items, until the nominal 12 months had passed. In actuality, no subject ran out of money before the 12th month.

At the end of the 12th month, the remaining money was either confiscated (in the "expire" condition) or carried over (in the "carryover" condition). The subjects kept the items purchased in the experiment as a part of reward for participation in both conditions. In the "carryover" condition, in addition, the remaining money was also given to the subjects as reward.

After the experimental sessions, the subjects were asked to provide feedback assessments of their purchasing behavior. Specifically, the subjects were requested to report "satisfaction" and "regret" ratings. In the satisfaction rating, the subjects were requested to report how satisfied they were with the purchases they made in a 7-point scale (1: Not at all satisfied. 2: Not satisfied. 3: Slightly not satisfied. 4:Neutral. 5: Slightly satisfied. 6: Satisfied. 7: Very satisfied). In the regret rating, the subjects were requested to report how regretful they were for the overall purchase history (1: Not at all regretful. 2: Not regretful. 3: Slightly not regretful. 4:Neutral. 5: Slightly regretful. 6:Regretful. 7:Very Regretful). The satisfaction rating measured the subjects' perception of the positives (satisfactory purchases, money well spent, etc.) of the purchase behavior, whereas the regret rating measured the subjects' perception of the negatives (missed purchasing opportunity, money wasted, etc.) The "efficiency" of the purchases was calculated by subtracting the regret rating (negatives) from the satisfaction rating (positives).
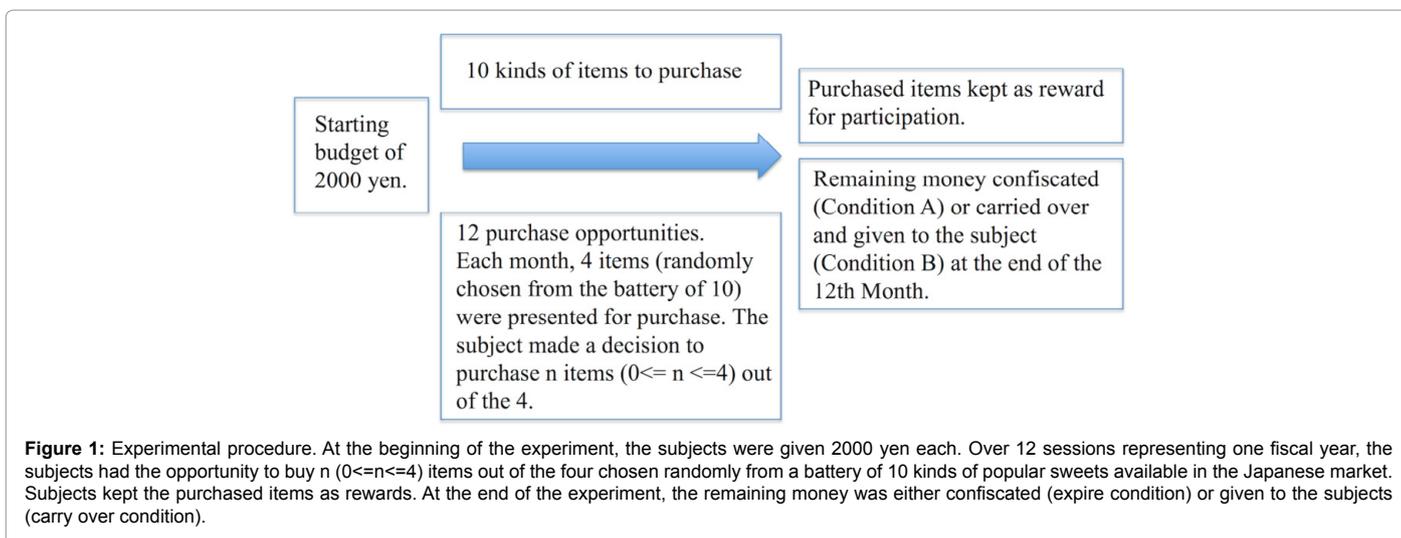
Figure 1: Experimental procedure. At the beginning of the experiment, the subjects were given 2000 yen each. Over 12 sessions representing one fiscal year, the subjects had the opportunity to buy n ($0<=n<=4$) items out of the four chosen randomly from a battery of 10 kinds of popular sweets available in the Japanese market. Subjects kept the purchased items as rewards. At the end of the experiment, the remaining money was either confiscated (expire condition) or given to the subjects (carry over condition).

Results

In the analysis, all Welch's t-tests with 12 samples for each group of data were two-tailed. The results of ANOVA applied to the two conditions were $F_{(11,11)}=2.59$ (p=0.00503) and $F_{(11,11)}=0.839$ (p=0.602) for the expire and carryover conditions, respectively, revealing a significant effect of month in the former. The number of purchased items for expire condition was significantly higher than for the carryover condition for the 10th (p=0.033) and 12th (p=0.047) month (Figure 2a). The number of purchased items in expire condition for the first nine months (the 1st month to the 9th month) and the last three months (the 10th to the 12th month) were 1.14 ± 0.46 and 1.42 ± 0.60 (average ± standard deviation), respectively (Figure 3a). The difference between the distribution for the first nine and the last three months was significant (p=0.015). The average number of purchased items in the carryover condition for the first nine months and the last three months were 0.99 ± 0.44 and 0.94 ± 0.53 (average ± standard deviation), respectively (Figure

3a). There was no significant difference between the distribution for the first nine months and the last three months (p=0.64).

The total price of items purchased in expire condition was significantly higher than that in the carryover condition in the 10th (p=0.020) and 11th (p=0.023) month (Figure 2b).

The average total prices of purchased items in expire condition for the first nine months (the 1st to the 9th month) and the last three months (the 10th to the 12th month) were 149.9 ± 65.6 and 204.4 ± 72.9 (average ± standard deviation), respectively (Figure 3b). The difference between the distributions for the first nine and the last three months was significant (p=0.00020). The average total price of purchased items in the carryover condition for the first nine months (the 1st to the 9th month) and the last three months (the 10th to the 12th month) were 134.5 ± 69.0 and 133.6 ± 94.9 (average ± standard deviation), respectively (Figure 3b). There was no significant difference between the distributions for the first nine months and the last three months (p=0.96).
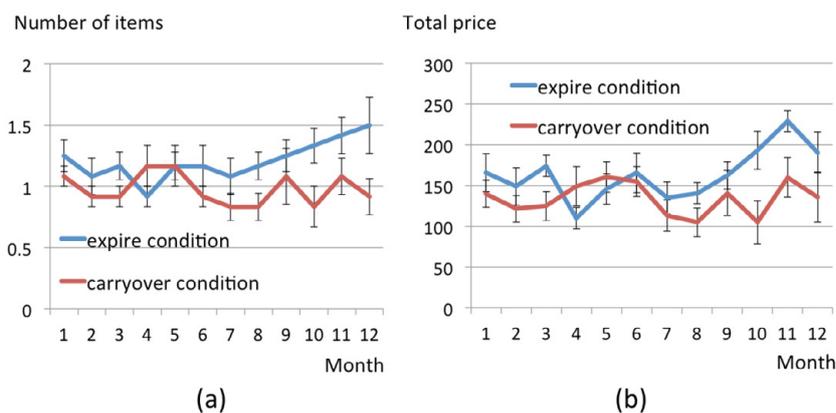
Figure 2: Purchase behavior under the two conditions (a) Monthly number of items purchased for the expire and carryover conditions. The number of purchased items for the expire condition was significantly higher than for the carryover condition in the 10th (p=0.033) and 12th (p=0.047) month. (b) Monthly total price of items purchased for the expire and carryover conditions. The total price for the expire condition was significantly higher than for the carryover condition in the 10th (p=0.020) and 11th (p=0.023) month.
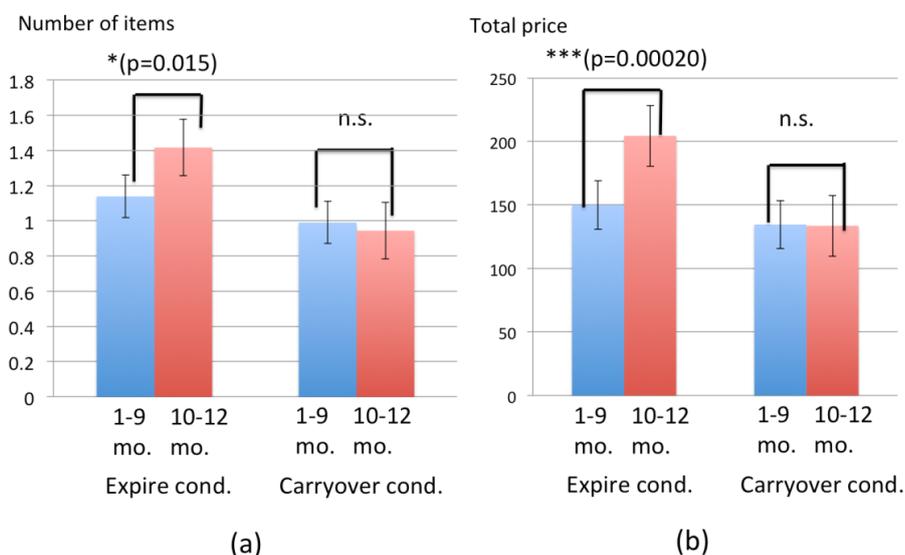
Figure 3: Comparison of purchase behavior for the first 9 months and the last 3 months.
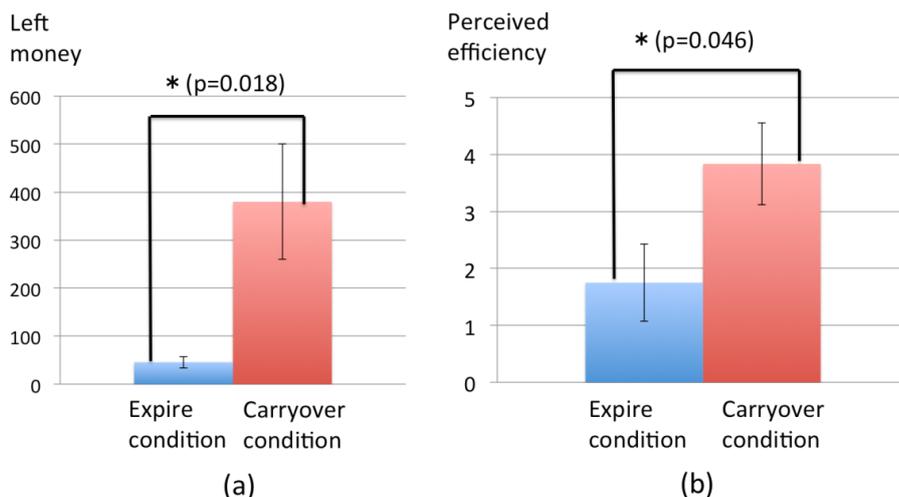
Figure 4: Comparison of purchasing behavior for the two conditions. (a) Money left after 12 months. The average values of unused money were 45.8 and 380 yen for the expire and carryover conditions, respectively, with standard deviations of 41.7 and 120 yen, respectively. The difference between the expire and carryover conditions was significant (p=0.018). (b) Efficiency perceived by the subjects. The average perceived efficiencies were 1.75 and 3.83 respectively, with standard deviations of 2.34 and 2.48, respectively. The difference between the expire and carryover conditions was significant (p=0.046).

Thus, there was a significant tendency of the subjects to overspend towards the end of the fiscal year in expire condition, while there wasn't such a tendency in the carryover condition.

When the total amounts of money spent over the year were compared, there were significant differences in the subjects' spending behavior between the two conditions. After the passage of 12 months, the average amount of unused money was 45.8 ± 41.7 and 380 ± 120 yen (average ± standard deviation) for expire and carryover conditions, respectively. The difference between expire and carryover conditions was significant (p=0.018, Figure 4a). In addition, there was a significant difference in the efficiency of spending (satisfaction minus regret). The perceived efficiencies for the purchases were 1.75 ± 2.34 and 3.83 ± 2.48 (average ± standard deviation) for expire and carryover conditions, respectively. The difference between the distribution for the two conditions was significant (p=0.046, Figure 4b).

Discussion

In most countries, allocation of budget is good only for one year, with the funds unspent returned to the treasury at the end of fiscal year [8]. This has nurtured a culture of wasteful overspending as the end of the fiscal year approaches. Despite the scientific and practical importance of this phenomenon, there exists only a limited literature on this phenomenon. To the best of our knowledge, the present study is the first attempt to reproduce this behavior in an experiment.

We have demonstrated here, in a simple setup, that the "end-of-year spending binge" can be reproduced in a laboratory environment. There was a tendency of subjects to spend more money for more number of items as the experiment neared the end of the fiscal year in the expire condition. The average amount of unused money was higher for the carryover condition than for the expire condition, reflecting the subject's careful manner of spending. The perceived efficiency of the spending was significantly higher for the carryover condition compared to the expire condition. Thus, we have successfully reproduced some salient features of the typical "end-of-year spending binge" in an experiment.

Some reservations must be made when interpreting the implications of our results. The passage of 12 months (one fiscal year, 525600 minutes in a non-leap year) was represented by 12 spending opportunities, requiring about 10 minutes. The difference in the passage of time (of the scale ~ 5×10^4) between the actual and represented situations might have affected the subjects' spending behavior. In the carryover condition, the remaining budget was given to the subjects as a part of reward for participation. In actual situations, the carried over budget would be used for purchases in the next year; there was no such arrangement in our setup. In actual situations, there is the risk of budget reduction when some money is left unspent in the expire condition; there was no such risk in our setup, as the experimental session was one-off. Our present work has thus endeavored to provide a generic framework, which captures the essential nature of the end-of-year wasteful overspending, with limitations such as those outlined above. In the context of principal-agent problem [4,5], there are two possible ways in which an ineffective spending by the agent (budget spending body) could be curbed [8]. One is through the introduction of incentives, under which the agent would be motivated to spend the money more effectively. The other is through monitoring, where the principal monitors the agent's behavior. Monitoring behavior would serve as the basis for regulation, enforcement and sanctions. In real situations, it is often not practical to monitor the detailed purchasing behavior of the agents: Insistency to do so could lead to bureaucratic culture which would further throttle efficiency. Monitoring could be costly both in terms of time and money [9]. From these perspectives, the introduction of appropriate incentives appears to be a practical, if not perfect, strategy.

Our results suggest that allowing the carryover of unused budget may be an effective way to curb the end-of-year spending binge, introducing an incentive for the spending agents, by allowing the unused budget to be used in the next fiscal year. Douglas and Franklin [7] discuss the policy in the state of Oklahoma, which allows agencies to carry over and reprogram year-end surpluses as long as the reprogrammed funds are spent within 16.5 months of the end of the fiscal year. In this study, it was found that carryover money generally amounts to less than 1 percent of total budget, with larger amounts carried over occasionally. The most common uses of carryover budget were noncapital equipment and computer technology

purchases. 72.5% of interviewed agency officials judged that carryover contributed to reduce wasteful end-of-year spending; while 82.5% answered it gave flexibility of spending. Jones [10] proposed to extend US federal government's obligation period from 12 to 24 months. Allowing carryover could be an effective tool to curb the end-of-year spending binge and prevent the accompanying deterioration in efficiency. The results reported in this study endorse such a view.

Allowing carryover, by itself, cannot guarantee the efficiency in public money spending. Due to an information asymmetry, it is not in general possible to know whether the surplus in budget was the result of efficient spending, or a lack of need for the budget in the first place [7]. A surplus in the budget at the end of the fiscal year could be the genuine result of an efficient spending (in particular, one without an end of the-year spending binge), or, alternatively, the result of a lack of need for the allocated resource. End-of-year surplus of budget may represent a lack of need, possibly the result of poor planning, or even an attempt by the agent to subvert the principal's control [11]. Permitting carryover could thus result in less efficiency, through the inadvertent maintenance of unnecessary budget. Allowing agencies to retain surplus budget may prevent the principal from relocating resources to higher priority fields, resulting in a smaller marginal benefit overall. Occasionally, the legislature requires that the carryover money be used for nonrecurring items, to prevent agencies from relying on the reallocated surplus money for regular operating expenditures [7]. When agencies receive funding from non-lapsing funds, with continuing appropriations, there is no need to reclassify end-of-year balances as carryover money [12]. These factors need to be taken into account when considering the effectiveness of carryover.

There are additional problems for budget spending. For example, the delay in the appropriation process due to the slow passing of the appropriation bills in the legislature could hinder efficient spending (Acquisition Advisory Panel (2007) "Report of the Acquisition Advisory Panel to the Office of Federal Procurement Policy and the United States Congress."). Such a delay would mean there would be less time available to plan and execute efficient spending. The effect of such delays on the efficiency of spending could be studied in an experiment like the one studied here, with additional constraints.

One of the contexts in which excessive spending occurs is the uncertainty in expenditure [8]. It is rational for spending agencies to prepare for a "rainy day", when there is uncertainty affecting the execution of budgets. In the present study, uncertainty was introduced by making only 4 of the 10 kinds of sweets available for purchase at a particular buying session. Due to the preference of the subject, he or she might have chosen to wait until a favorite item was offered for purchase. Such a waiting behavior might result in a late execution of the budget, leading to a spike in expenditure near the end in the expire condition.

It is of scientific and practical interest to compare the effects of alternative schemes affecting budget spending behavior [13]. The "code is law" argument [14] claims that social "codes" such as computer programs are as much a denominator of people's behavior as conventional legal systems. It is possible to require, by explicit regulations, that the budget spending agents do not indulge in an end-of-year spending binge. This is the conventional approach. It is also possible, on the other hand, to configure the rules of budget spending in such a way (e.g., the "carryover" condition as opposed to "expire" condition) that the spending agents are induced to refrain from indulging in an inefficient overspending in a spontaneous manner. Our present research endorses such an approach, with the limitations and reservations discussed above.

In sum, we have reproduced the wasteful end-of-year spending binge in an experiment. By studying behavior in an artificial setup, we have identified parameters potentially affecting overspending and inefficiency towards the end of the fiscal year. Such an approach would provide tools to study and rectify problematic spending behavior in real-life situations.

Ethics Statement

The experimental procedure was submitted to and approved by the brain and cognitive sciences ethics committee of Sony Computer Science Laboratories. The experiments were conducted in accordance with the approved guidelines. The subjects signed a written consent form.

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