A survey suggests individual priorities are virtually unique: Implications for group dynamics, goal achievement and ecology

Eckart Bindewald [a,b,*]

[a] Department of Mathematics, Frederick Community College, Frederick, MD, United States
[b] Department of Biology, Hood College, Frederick, MD, 21701, United States

ABSTRACT

Recently, a game-theoretic analysis highlighted the attractiveness of motivation asymmetry and anti-coordination as a strategy for groups to achieve multiple simultaneous goals. To test the prevalence of motivation asymmetry, a survey was performed that asked participants to divide resources among four different societal goals pertaining to economic growth, poverty reduction, health and environmental protection. It is shown, that the survey responses can be modelled by a Dirichlet distribution. It is argued, that the observed high diversity in priority combinations – while at first sight a problem – can be viewed as evidence for an "individual purpose game", where there is a one-to-one mapping between group participants and the goals they are highly motivated to achieve. Based on these results, two strategies (the majority strategy and the heroic effort strategy) for achieving multiple simultaneous goals in a group are discussed. It is argued, that motivation asymmetry can – if understood in the light of game theory of voluntary efforts – lead to highly effective groups. Also, important implications for the field of ecology are dissussed.

© 2017 Elsevier B.V. All rights reserved.

1. Introduction

Living entails juggling multiple goals. Much research has been performed analyzing how individuals rank-order societal goals such as economic growth in contrast to goals like environmental protection. In multiple studies it has been found that economic concerns are at the top or near the top of priorities, while items such as health issues rank lower and environmental concerns rank even lower (Upham et al., 2009). Typically, survey participants have in such studies the option to choose their top (such as top 2 or top 5) concerns from a list of options (Kohut, 2009), (EC, 2011). The reported consensus lists of top concerns do not contain information, however, about which goal combinations are frequently ranked highly together in the same indviduals. Also, the choices given to study participants typically do not allow for fine-grained options of how to allocate resources among different areas of concern.

Here, a different kind of goal priority survey is performed. Importantly, the focus was not only on the obtained averages, but on the uniqueness (or lack thereof) of individual priority combinations. Survey subjects had to imagine being in a position where they can divide resources of a non-profit organization among four different goals: economic growth, improve global health, reduce poverty or alleviate environmental decline. Those four numbers (percentages that had to add up to one hundred) lead to a 4-dimensional space.

One key question is, how these priorities are distributed. One can imagine three different outcomes: A: similar priorities among a high fraction of participants point towards a goal-solving strategy of cooperation, focusing on the goal(s) that are deemed to be important. B: A second possibility is "tribes": Highly grouped or clustered results would lead to a model of "moral tribes" (Greene, 2014). In this model, groups are frequently polarized, but form quite homogeneous sub-groups who have similar views and priorities. C: A third possibility would be a more or less continuous spectrum of goal priorities. Such a strategy would correspond to a "unique purpose" scenario, in which groups are challenged with a large number of goals (larger or equal compared to the number of group members), and each group member has a unique combination of priorities that is uniquely destined to attach a high motivation towards one unique goal and a relatively low motivation towards the other goals.

This raises the question of what kind of strategies are conducive to actually achieving goals in large groups. Theoretical evidence is presented, that suggests that the choice of the most promising strategy depends on the problem at hand – in particular on the cer-
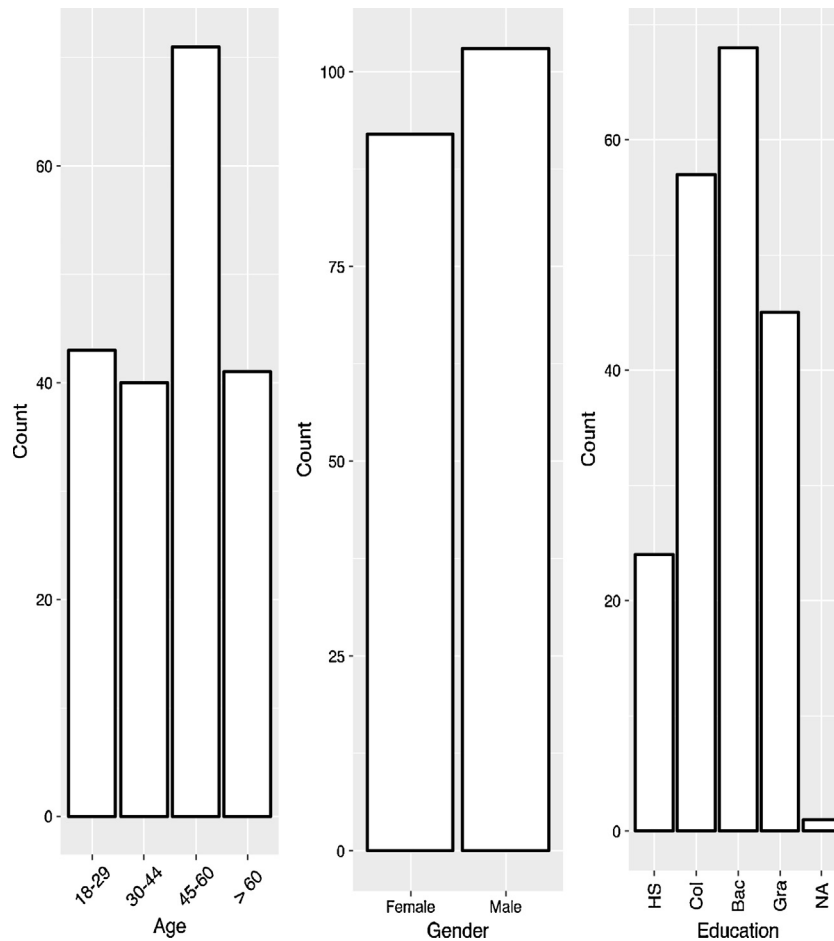
Fig. 1. Histograms of age, gender and highest achieved education of survey participants. HS: high school degree; Col: some college; Bac: bachelor's or associate degree; Gra: graduate degree (masters or doctorate degree); NA: no degree.

tainty of the ability to implement prescriptive or incentive actions. Two types of strategies are presented: the "majority"-strategy of attempting to obtain political consent, that then can be used to implement prescriptive or incentive approaches. The second strategy is the "heroic effort" strategy of building on voluntary efforts that are such that a motivated minority solves the problem at hand.

This paper is organized as follows. First, the performed survey is described, analyzed and modelled. Next, a voting model is presented. In the Discussion section, the survey results are interpreted in the light of game theory. The case of potential goal conflicts in general and conflicts between economic and environmental goals in particular is discussed. Next, strategies for achieving goals that are of high importance only to a minority are presented. Subsequently, a semi-mechanistic "emotional fingerprint" model is proposed that could potentially account for the observed diversity in priority combinations. Lastly, it is discussed that differences in sentiment are also found among different animal species. Several arguments are presented that such behavioral trait variations likely have profound implications for the field of ecology, because trait variations influence intra- and inter-species interaction networks and may increase the success of a species.

2. Materials and methods

An administered online survey corresponding to at least 200 survey responses was purchased from a survey provider (SurveyMonkey Audience, https://www.surveymonkey.com/mp/audience/). Note that this does not correspond to voluntary response sampling or convenience sampling, because survey subjects are randomly chosen not by the author but by the survey provider among participants who live in the U.S. and agreed to participate in a variety of surveys. The survey provider is also utilizing a methodology in order to randomly choose participants such that the sample is representative of the U.S. population. In addition, the stated gender, age range, income range and education status of the survey participants is provided.

The wording of the question was: "Imagine you would be in charge of a nonprofit organization whose goal it is to help solve pressing global problems. How should financial resources be allocated towards the solution of the four global problems listed below? Enter percentage values that add up to one hundred. The four presented options were: i) Reduce climate change and biodiversity loss, ii) Improve economy, iii) Reduce poverty, iv) Improve global health. In other words, the survey asks participants to enter four numbers that add up to one hundred. 242 responses initial were collected in October 2012. Responses were removed that did not contain four numbers, or where the four numbers do not add up to one hundred or where age, or gender information was missing.

The data analysis was performed using the R programming language. The fitting of the multi-dimensional Dirichlet distribution was performed using the *dirmult* R package (Tvedebrink 2010).

The estimated expected outcome in terms of environmental donations is computed as follows. A computational loop generates threshold values between 0 and 100%. For each threshold value, the probability is estimated, of randomly selecting a group of specified size, such that at least half of the group members are