What leads to changes in the intention to commit to pollinator conservation behaviors?

Conor Fair and Kris Braman: Department of Entomology, University of Georgia, Athens GA

INTRODUCTION

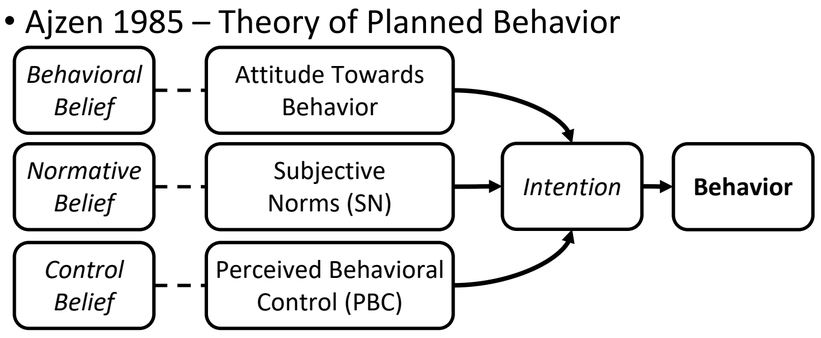
- Gap between increase in awareness/concern and efforts to support pollinator conservation[1]
- How do we communicate/encourage these behavioral changes to increase adoption of pollinator conservation best management practices (BMPs)? [2]
- Conventional methods (e.g., education, incentives, and regulation) can be more effective when combined with other drivers of human behavior (e.g., norms, attitudes, and beliefs) [3]
- Recent surveys[4,5] have used well-established theories (Theory of Planned Behavior – TPB, Norm Activation Theory – NAT, and Value Belief Norm Theory – VNT) to study drivers that may change human behavior

SURVEY DESIGN

- Online survey delivered via QR code and anonymous link with Qualtrics Software
- Questions developed to measure intention to perform pollinator conservation BMPs as predicted by constructs in human behavioral psychology theories (e.g., TPB, NAT, and VNT)
- Three survey populations: Undergraduate Students (887 responses), Master Gardeners (534 responses), Pollinator Census Newsletter (139 responses)
- Analysis – Two Approaches 1) Ordered Logistic Regression and 2) Exploratory Factor Analysis to identify relevant constructs impacting intention

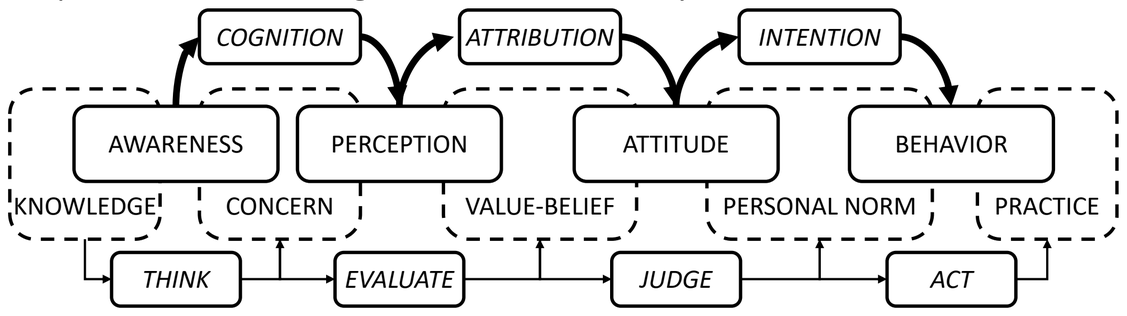
STRUCTURAL EQUATION MODEL: THEORY

- Ajzen 1985 – Theory of Planned Behavior



- Behavior requires a positive attitude, expectation that others will perform behavior, and feeling capable of implementing behavior.
- Intention is the best predictor of performing behavior
- Other theories build on TPB to propose more complex determinants/constructs

- Topal et al. 2021 – Integrated Behavior Theory



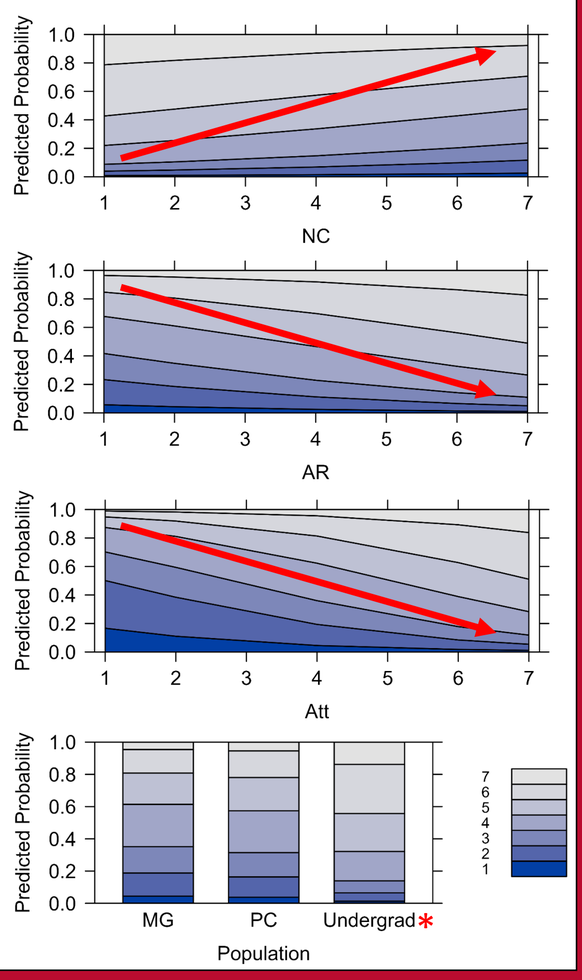
- Socio-psychological determinants/constructs interrelated and unified, drawn from many theories
- Four primary – awareness, perception, attitude, behavior
- Four secondary – knowledge, concern, value-belief, personal norms – others from literature
- Test theoretical determinants/constructs on intention to create a measurement instrument

LOGISTIC REGRESSION

- 7-Level Likert Dependent Variable – Intention to perform pollinator conservation behaviors (PCBs): 1 – Strongly Disagree to 7 – Strongly Agree
- Averaged response from eleven (see table below) 7-Level Likert Independent Variables (e.g., mean (NC1, NC2, …))
- Demographic data – Survey Population, Gender, Age, etc.
- Highlighted cells indicate a significant effect on the intention to perform various pollinator conservation BMPs and the direction of the effect
- Effects of Nature Connectedness (NC), Ascription of Responsibility (AR), Attitude (Att), and Survey Population on Intention to mow areas less than once per month – example of intention to modify behavior
- Increases in NC → less likely to strongly agree
- Increases in AR and Att → more likely to strongly agree
- Undergraduates more likely to strongly agree

Type of Questions
Active
Behavior
Other
Engage

Pollinator Conservation BMPs	Pollinator Census	Undergrads	NC	SN	MN	AR	NEP	IO	PrevBehav	IA	PBC	Att	LKA	Female	Age	Living	Income	Education	Political
Plant pollinator-friendly garden						+		+	+	+	+	+		+					
Plant flowering trees or shrubs								+	+		+	+		+			+		+
Create wildflower meadow, or strips				+		+			+		+	+	+	+	-				
Give sugar water to tired bees		+				+	+	+	+	+		+		+	-				+
Provide artificial nest sites for pollinators						+			+			+	+	+	-				+
Create ground-nesting habitat for bees						+			+	+		+	+						+
Leave areas of vegetation for wildlife						+		-	+		+	+		+					
Leave flowering weeds in my garden/fields	+	-				+	-	+	+	+		+		+					
Mow areas less than once per month		+	-			+			+	+		+		+	-		-		
Leave areas unmown/undisturbed		+		-		+			+	+	+	+		+					
Avoid using herbicides when possible	+				+				+	+		+		+					
Avoid using insecticides when possible					+				+	+	+	+		+				-	
Keep hives of honey bees		+				+			+			+			-				+
Sign a petition to "save the bees"	-	+	-	+		+	+		+	+		+		+					-
Encourage others to protect pollinators		+	-		+	+	+	+	+		+	+	+	+					
Sign a conservation petition	+	+		+		+	+		+	+		+	+	+	+			+	-
Volunteer for a conservation organization	+	+	+		-	+			+	+		+	+		+				



EXPLORATORY FACTOR ANALYSIS

- 638 observations retained – numerous item non-response issue
- Randomly sample half for exploratory factor analysis
- KMO=0.93; Bartlett's test– χ^2=14952.09, df=2485, p value <0.001
- Parallel Analysis Scree Plot suggests to extract eight factors – 11 factors proposed
- We assume factors are non-independent – oblique rotation, "oblimin" method
- Heat map of factor loadings – values > |0.4| are highlighted

	ML1	ML7	ML8	ML4	ML5	ML2	ML3	ML6
NC_1	-0.11	-0.01	-0.07	**0.83**	0.01	-0.08	0.01	0.14
NC_2	-0.05	0.01	-0.06	**0.92**	-0.07	-0.03	0.02	0
NC_3	0.14	-0.02	0.11	**0.7**	0.07	-0.02	-0.01	-0.17
NC_4	0.23	0.02	0.1	**0.49**	0.03	0.01	0.01	-0.07
NC_5	0.27	0.04	0.05	**0.59**	0.07	0.01	0.04	-0.05
NC_6	0.02	-0.05	0.08	**0.82**	-0.03	0.01	0.07	0.02
SN_1	**0.51**	-0.07	0.16	0.08	-0.02	0.1	0.12	-0.11
SN_2	0.37	-0.03	-0.04	0.06	0.1	0.12	0.11	0.23
SN_3	0.26	0.02	0.04	0.05	0.03	0.1	0	-0.1
SN_4	**0.5**	0.08	0.33	0.01	-0.01	-0.1	0.08	-0.01
SN_5	**0.43**	-0.07	0.16	0.16	0.04	0.01	0.16	0
MN_1	**0.61**	0.11	0.12	0.1	0.01	-0.01	0.12	-0.04
MN_2	**0.52**	-0.14	-0.06	0.09	0.04	0.07	0.24	0.3
MN_3	**0.58**	0.07	-0.08	0.12	0.09	0.05	0.13	0.1
MN_4	**0.73**	0.06	0.05	0.04	0.09	0.06	0.04	0.02
AR_1	0.37	-0.06	-0.19	0.06	0.09	0.21	0.04	0
AR_2	0.21	0.16	0.28	-0.03	-0.08	**-0.44**	0.03	0.13
AR_3	**0.58**	0.26	0.15	0.07	0.03	0.11	-0.05	-0.05
AR_4	**0.5**	0.22	0.02	0.04	0.02	0.21	-0.1	-0.08
NEP_1	0.03	0.05	-0.2	0.21	0.21	0.26	0.05	-0.03
NEP_2	0.2	-0.17	-0.24	-0.04	0.29	0.23	0.09	0.3
NEP_3	0.19	-0.07	-0.07	-0.04	0.2	0.26	0.05	-0.08
NEP_4	0.05	-0.12	0.04	0.02	0.24	0.22	0.18	0.03
NEP_5	-0.01	0.04	-0.13	0.01	-0.17	-0.01	0.04	0.01
IO_1	0	0	0.01	0.05	0	-0.02	**0.89**	-0.01
IO_2	0.21	0.11	0.17	-0.01	0.04	-0.05	0.05	0.03
IO_3	0.2	0.13	0.29	-0.03	0.06	-0.22	0.21	0.1
IO_4	-0.03	0.07	0.02	0.1	0	0.03	0.25	0.23
IO_5	0	0	0.02	0.01	-0.01	0.01	**0.93**	-0.05
IO_6	0.1	0.05	0.1	-0.06	0.05	-0.13	0.15	-0.06
IA_1	0.02	-0.01	-0.04	0.06	**0.75**	0.01	-0.02	-0.16
IA_2	0.2	-0.05	-0.12	-0.08	**0.63**	0.18	-0.1	0.04
IA_3	-0.07	0.03	0.06	-0.14	**0.5**	0.09	0.27	-0.09
IA_4	-0.12	0.14	0.07	-0.04	**0.57**	-0.11	0.16	0.03
IA_5	-0.15	0.25	0.06	0.07	0.38	0.14	-0.14	-0.15

	ML1	ML7	ML8	ML4	ML5	ML2	ML3	ML6
IA_6	0.07	-0.13	0.03	0.05	**0.74**	-0.02	0	0.16
IA_7	-0.12	0.05	0.08	0.01	**0.61**	-0.13	0.07	0.04
IA_8	0.07	0.1	-0.05	0.12	**0.46**	0.05	-0.09	-0.1
IA_9	-0.07	0.3	-0.05	0	0.35	0.21	-0.06	-0.18
IA_10	0.05	0.03	0.1	-0.09	**0.65**	-0.07	0	0.19
PBC_1	0.04	0.13	**0.45**	0.14	0.23	0.07	0.02	0.13
PBC_2	-0.18	0.01	**-0.4**	0.03	0	0.11	-0.11	-0.12
PBC_3	0.06	0.17	0.31	0.14	0.27	0.11	-0.08	-0.02
PBC_4	0.04	0.05	**0.74**	0.07	0.09	0.01	0.05	-0.09
PBC_5	0.01	0.09	0.26	0.18	0.26	0.03	0.15	0.21
Att_1	0.16	0.19	0.18	0.25	0.03	0.1	0.23	0.15
Att_2	0.11	0.28	0.26	0.16	0.02	0.01	0.27	0.07
Att_3	0.26	0.26	0.22	0.14	0.03	0.14	0.15	0.14
Att_4	0.25	0	0.03	0.11	0.15	0.15	0.13	**0.41**
Att_5	0.16	0.34	0.08	-0.01	0.17	0.14	-0.04	0.04
LKA_1	-0.06	-0.06	**0.7**	0.03	-0.07	0.08	0.13	-0.02
LKA_2	0	-0.06	**0.79**	0.05	0.01	0.08	0.01	0.09
LKA_3	0.14	0.03	**0.68**	0.03	-0.04	-0.13	0.05	0.02
LKA_4	0.12	-0.05	**0.54**	0.01	0.07	-0.01	0.16	0.15
Int_1	0.11	**0.45**	0.12	0.05	-0.05	0	0.17	0.27
Int_2	-0.02	**0.46**	0.15	0.14	-0.06	0.06	0.08	0.24
Int_3	0.16	**0.63**	0.08	0.07	-0.02	-0.06	0.03	0.08
Int_4	0.1	**0.54**	-0.19	-0.03	0.08	0.01	0.05	0.28
Int_5	0.09	**0.54**	-0.12	0.02	0	0.11	-0.09	0.18
Int_6	0.12	**0.48**	-0.09	-0.04	0.12	-0.04	0.05	0.24
Int_7	-0.02	0.16	0.13	0.07	0.07	0.19	0.02	**0.62**
Int_8	-0.04	0.14	0.13	0.17	0.15	0.16	-0.02	**0.59**
Int_9	0.02	**0.42**	-0.12	0.01	0.04	0.35	0.19	-0.12
Int_10	0.06	**0.58**	0.17	0.01	0	0.1	0.13	-0.04
Int_11	0.07	**0.55**	0.18	0.09	0.12	0.1	-0.02	-0.03
Int_12	-0.04	**0.54**	-0.16	-0.01	-0.02	0.19	0.11	-0.2
Int_13	0.03	-0.01	-0.04	-0.07	0.02	**0.81**	0.07	0.11
Int_14	0.02	0.35	0.04	0.12	0.03	0.05	0.12	**0.4**
Int_15	0.31	0.24	0.06	0.03	-0.01	0.36	0.11	0.14
Int_16	0.09	0.06	0.11	-0.05	-0.05	**0.83**	-0.05	0.05
Int_17	-0.05	0.28	0.19	0.19	0.1	**0.41**	-0.07	-0.01

DISCUSSION

- Ordered logistic regression results suggest that some constructs are more influential than others
  - Previous Behaviors, Attitudes, Ascription of Responsibility, and Awareness
- Effect of nature connectedness has a negative effect on the intention to adopt pollinator conservation BMP – counter to what was found in Knapp et al. 2020
- Effects of ascription of responsibility and attitudes have a positive effect on the intention to adopt pollinator conservation BMP – look at level of responsibility
- Undergrads more likely to mow less – I would have liked to do fewer chores too!
- Exploratory factor analysis suggests several items do not have strong enough loadings – which suggests targets for refining future versions of the survey
- New Ecological Paradigm doesn't have any strong factor loadings
  - Need to find another means to measure concern
- Some determinants/constructs load onto same factor – could suggest interrelatedness and more complex model

FUTURE DIRECTIONS

- Additional rounds of surveys to measure more generalized populations
- Refine survey items to have stronger factor loadings
- Continue to confirmatory factor analysis and develop structural equation model

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