

Vantage Sensitivity as a Function of Genes: Genetic Moderation of Relationship

Intervention Effects

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Background: The notion that some people are more vulnerable to adversity as a function of genetic characteristics is widely embraced in the fields of developmental and clinical psychology. This is reflected in the popularity of the diathesis-stress and dual-risk frameworks which have received a vast amount of empirical support over the years. Much less effort, however, has been directed towards the investigation of genetic factors associated with variability in response to exclusively *positive* influences, including psychological intervention. One reason for the dearth of studies investigating individual differences in response to positive experiences as a function of inherent characteristics may be the absence of adequate theoretical frameworks for such variability. According to the differential-susceptibility hypothesis (Belsky & Pluess, 2009) individuals generally vary in their developmental plasticity regardless of whether they are exposed to negative or positive conditions. The recently proposed concept of *Vantage Sensitivity* (Pluess & Belsky, 2013), derived from the empirically well-supported and evolutionary-theory inspired perspective of differential susceptibility, offers a new theoretical framework for variation in response to exclusively positive experiences, including psychological intervention, as a function of individual endogenous characteristics, including genetic factors.

We will first introduce the basic properties of the *Vantage Sensitivity* framework and the corresponding terminology as well as important conceptual differences between *Vantage Sensitivity* and theoretically-related concepts of resilience and differential susceptibility. Next, we will present preliminary findings of a study aimed at investigating vantage sensitivity as a function of different genetic factors in response to the Prevention and Relationship Enhancement Program (PREP; Markman, Stanley, & Blumberg, 2010), a relationship education program for couples.

PREP was initially designed in the late 1970s based on the best available research at the time, as well insights from the development and testing of other programs (Guerney, 1977; Miller, Nunnally, & Wackman, 1976). It was based on behavioral models of marital therapy (e.g., Markman, 1979; Markman & Floyd, 1980) as well as research on conflict and communication in couples (e.g., Birchler, Weiss, & Vincent, 1975; Gottman, Markman, & Notarius, 1977). Since its inception, it has been revised and refined based on new research on couple processes and predictors of distress and divorce. Several versions and adaptations are now available (see overview in Ragan, Einhorn, Rhoades, Markman, & Stanley, 2009). In random-assignment studies, PREP has been shown to increase communication skills (Allen, Stanley, Rhoades, Markman, & Loew, 2011; Kaiser, Hahlweg, Fehm-Wolfsdorf, & Groth, 1998; Markman, Floyd, Stanley, & Storaasli, 1988), to increase relationship satisfaction (Markman et al., 1988), and to prevent divorce (Stanley, Allen, Markman, Rhoades, & Prentice, 2010) within the first two to three years after intervention. The longest follow-up of PREP to date was a study that evaluated differences between PREP and no-treatment control at five years post intervention. In that study, couples who received PREP had lower observed negative communication and less physical aggression than couples in the control group (Markman, Renick, Floyd, Stanley, & Clements, 1993).

However, it is unknown whether these treatment effects of PREP are moderated by genetic differences as suggested by *Vantage Sensitivity*. The primary goal of the current study is to investigate individual differences in response to the positive effects of PREP as a

function of genes, evaluating whether effects of PREP on marital quality, parenting quality and child behavioral outcomes are moderated by putative “plasticity” gene variants.

Methods: The sample for the current study was drawn from those families who were initially recruited between 1996 and 2001 for a study of the effectiveness of PREP. At that time, all couples were about to marry. They were randomly assigned to receive 1) the naturally-occurring premarital training services at the religious organization that would perform their wedding, 2) PREP at the religious organization that would perform their wedding (delivered by religious organization staff), or 3) PREP at a university setting delivered by university staff. (The basic 12-hour PREP curriculum that focuses on skills for communicating and managing conflict, strategies for clarifying expectations, as well as information on commitment, fun and friendship, and forgiveness was used.) These couples completed a post assessment several weeks after intervention and, since then, they have completed yearly assessments (including behavioral observations) of relationship dynamics and adult functioning.

Participants and Procedure. To be included in the current study, couples needed to speak and read English and to have been entering a first marriage ($N = 227$) when the original PREP evaluation study started. Of these, we excluded couples who never married ($n = 6$) and who only had pre-intervention assessment (“pre”) scores and no other follow-up assessments ($n = 14$). Further, we excluded couples who do not have a biological child together who is aged 6 to 18 during the study period, leaving a final N of 171 families (or 513 individuals). As part of the on-going longitudinal project, these 171 couples completed annual assessments including self-reports and videotaped interactions following intervention. Most have 8 to 15 waves of data. The videotaped interactions included a problem discussion and have been coded using the Interactional Dimensions Coding System (Kline et al., 2004). Self-reports included 1-1.5 hours of questionnaires regarding relationship functioning (e.g., communication, satisfaction, and commitment) and individual wellbeing (e.g., depression, alcohol use). Whenever possible, published scales with strong validity and reliability have been used.

DNA Extraction and Genotyping. Saliva samples are being collected from all recruited couples and their first born children using Oragene DNA kits (DNA Genotek, OGD-500). DNA will be extracted and genotyped for a selection of candidate genes. The candidate genes included in the current study were selected based on evidence assembled by Belsky and Pluess (2009) as well as some additional plasticity genes which emerged more recently (Belsky & Pluess, 2013) and include DRD4, 5-HTTLPR, MAOA, DRD2, COMT, BDNF, and OXTR.

Planned Data Analyses. We will use 4-level multilevel models as recommended by Atkins (2005) and detailed below (for an example with similar data, see Allen, Rhoades, Stanley, Loew, & Markman, 2012). As was done with phenotypical variables in Allen et al. (2012), we will test for genetic moderation of intervention effects by adding genetic variables (e.g., presence/absence of the DRD4 7-repeat allele) to level 2 in the equation below and testing for the resultant treatment group X genetic pattern interactions.

$$\text{Level-1 (Time): } \text{Marital Quality}_{ijk} = \pi_{0ijk} + \pi_{1ijk}(\text{Time}_{ijk}) + e_{ijk}$$

$$\text{Level-2 (Individual): } \pi_{0ijk} = \beta_{00jk} + \beta_{01jk}(\text{Pre-Intervention Marital Quality}_{ijk}) + r_{0ijk}$$

$$\pi_{1ijk} = \beta_{10jk} + \beta_{11jk}(\text{Pre-Intervention Marital Quality}_{ijk})$$

$$\text{Level-3 (Family): } \beta_{00jk} = \gamma_{000k} + u_{00j}$$

$$\beta_{01jk} = \gamma_{010k}$$

$$\beta_{10jk} = \gamma_{100k}$$

$$\beta_{11jk} = \gamma_{110k}$$

$$\text{Level-4 (Cohort): } \gamma_{000k} = \delta_{0000} + \delta_{0001}(U\text{-PREP}_k) + \delta_{0002}(RO\text{-PREP}_k) + v_{000k}$$

$$\gamma_{010k} = \delta_{0100}$$

$$\gamma_{100k} = \delta_{1000} + \delta_{1001}(U\text{-PREP}_k) + \delta_{1002}(RO\text{-PREP}_k) + v_{100k}$$

$$\gamma_{110k} = \delta_{1100}$$

Expected Results

Data collection for the described analyses is still on-going at this moment. We are currently in the process of genotyping a subsample of 70 families (i.e. 210 individuals) and will present preliminary findings of this subset at the IGSS meeting in October. Based on the framework of Vantage Sensitivity (Pluess & Belsky, 2013) we expect that individuals carrying plasticity genes will benefit significantly more from PREP compared to those with different genotypes. Such gene-intervention interaction findings would illustrate empirically that not all spouses and children benefit from the same intervention to the same degree and that some spouses and children, those less susceptible, may require different treatment. The notion that there could be individual differences in responsivity to relationship programs is crucial for future evaluations of such programs. The efficacy of relationship promoting interventions is likely to be misinterpreted—that is, underestimated—in the case of more susceptible and overestimated in the case of less susceptible individuals, if between subject variability in developmental plasticity is not taken into account.

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