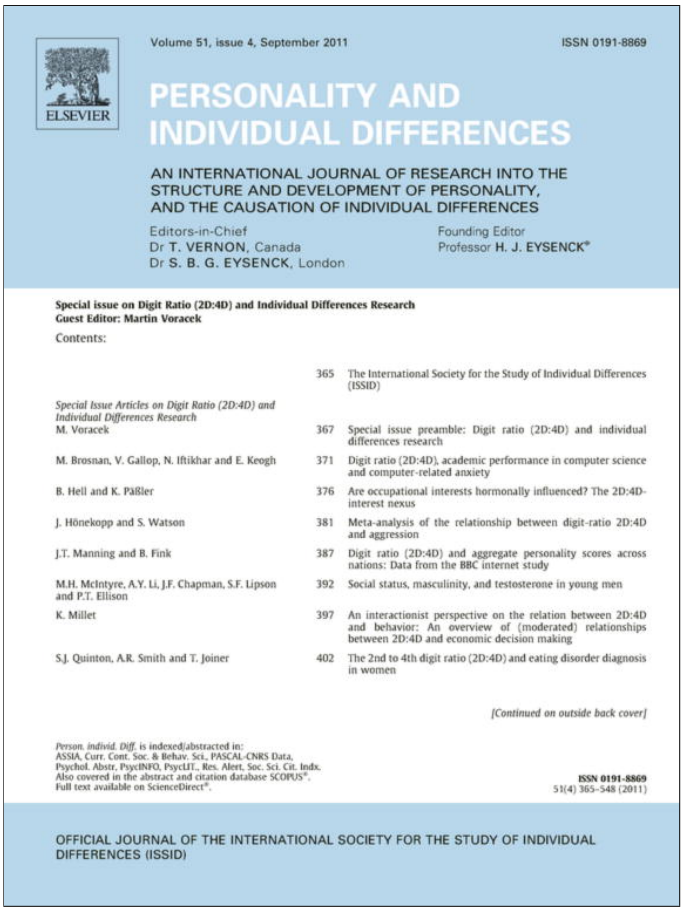

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General causality orientations are distinct from but related to dispositional traits

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ABSTRACT

This study examines overlaps and distinctions between concepts of individual differences in the five-factor model and self-determination theory. Participants were 223 Danish adults (age $M = 43.74$; 60.09% women) originating in a national probability sample. Participants completed questionnaires of personality traits (NEO-FFI) and general causality orientations (GCOS). Distinct and overlapping latent models were tested using structural equation modeling, statistical re-sampling, and confirmatory factor analysis. Results indicate that all three causality orientations are distinct from but related to traits. From a perspective of integrative personality psychology, general causality orientations can be conceived of as characteristic adaptations.

1. Introduction

When concerned with integrative personality psychology, one aim has been to separate the domain of characteristic adaptations from dispositional traits (McAdams & Pals, 2006). The current study investigates whether individual differences in general causality orientations, which are conceptualized as tendencies towards degrees of internalized self-regulation (Deci & Ryan, 1985, 2000), can be distinguished from individual differences in dispositional personality traits (McCrae & Costa, 2008). Notably, it has been suggested that causality orientations are characteristic adaptations (Olesen, Thomsen, Schnieber, & Tønnesvang, 2010). That is, causality orientations can be viewed in terms of motivational, social-cognitive, and developmental adaptations of dispositional traits, and thus to a greater extent than traits, they are shaped by contingencies in psychosocial contexts.

Dispositional traits are individual differences in tendencies to show continuity in thoughts, feelings, and actions (McCrae & Costa, 2008). These broad dimensions are organized in an extensive taxonomy; the five-factor model (FFM), which is often referred to as the "Big Five" structure of neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness (John, Naumann, & Soto, 2008). Further, the FFM theory claims causality between trait dimensions and their hypothesized dependent variables (e.g., well-being states), which is supported by a strong predictive validity of traits but also by findings that traits show (neuro-) biological and genetic correlates and considerable stability in adulthood (McAdams & Pals, 2006).

General causality orientations originate in the motivational self-determination theory (SDT; Deci & Ryan, 1985). Central to SDT are claims that human growth and activity potentials are inherent and that they are achieved through satisfaction of basic psychological needs for experiencing autonomy, competence and relatedness (Deci & Ryan, 2000). The theory could be characterized as predominantly a social psychological theory, due to its strong emphasis on contextual determinants of need satisfaction experiences and emotions that in turn ensure internalization and self-regulation of behavior. Nonetheless, SDT proponents argue that these experiences and regulations develop, although they are influenced by facilitating and thwarting aspects of psychosocial environments, into consistent individual differences in personality (Deci & Ryan, 2000). These individual differences are conceptualized by the following three dimensions of general causality orientations: (1) autonomy orientation (autonomy), referring to a tendency towards *high* degrees of internalized self-regulation, such as experiencing behavior and choices as free and volitional and in accordance with one's own standards and beliefs; (2) control orientation (control), referring to a tendency towards *low* degrees of internalized self-regulation, such as experiencing behavior and choices as conflicted and pressured by imperatives in social norms and cultural values; (3) impersonal orientation (impersonal), referring to *lacking* degrees of internalized self-regulation, such as experiencing behavior and choices as inefficient, incomprehensible, and beyond intentional control (Deci & Ryan, 1985).

Both the FFM and SDT theorize about personality through individual differences. Thus an important question is, whether causality orientations address the same underlying concepts as traits or whether SDT describes different aspects, such as characteristic adaptations. In support of a hypothesis of conceptual overlap, the contents of dispositional traits and general causality orientations

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are described similarly, and traits and orientations predict similar variables (e.g., well-being states): autonomy and extraversion encompass engagement in social interaction, activity, and well-being outcomes, while autonomy and agreeableness encompass honesty, trust, and understanding in social relations; control and reversed agreeableness encompass hostility and defensive aggression as well as distrust and dismissive anger in social relations; and impersonal and neuroticism encompass avoidance behavior, helplessness, and ill-being outcomes (Deci & Ryan, 1985; McCrae & Costa, 2008; Olesen et al., 2010). Based on such theoretical analyses one might hypothesize that there are conceptual overlaps between traits and orientations.

Previous research has examined relationships between individual differences in the FFM and SDT. One study found that autonomy was unrelated to traits, though control was related to reversed agreeableness (Koestner & Losier, 1996). Another study found that autonomy was related to extraversion and agreeableness, while control was related to reversed agreeableness, and impersonal was related to neuroticism and reversed extraversion (Deponte, 2004). Other studies have found that the concepts of "authenticity" (Sheldon, Ryan, Rawsthorne, & Ilardi, 1997) and "autonomy support" (Lynch, La Guardia, & Ryan, 2009), which are similar to autonomy, were related to extraversion, openness, agreeableness, and conscientiousness, as well as reversed neuroticism. These empirical relationships may be attributable to conceptual overlaps and/or actual relationships between distinct but meaningfully related constructs.

One particular study has examined the conceptual underpinnings of individual differences in the FFM and SDT by testing empirically for shared latent variables. Olesen et al. (2010) applied an exploratory strategy in confirmatory factor analysis (CFA) and found that autonomy can be distinguished from traits, despite correlations with extraversion, openness, agreeableness, and conscientiousness; control showed both conceptual overlap with reversed agreeableness and distinction between control and agreeableness and other traits, as well as a correlation with reversed agreeableness; impersonal showed both conceptual overlap with neuroticism and distinction between impersonal and neuroticism and other traits, as well as correlations primarily with neuroticism and reversed extraversion. Olesen et al. (2010, p. 542) pointed out that: one distinguishing feature, which is encompassed by causality orientations, is individual differences in understanding the causes and reasons for one's behavior in social relations (i.e., *perceived locus of causality*). Based on these recent findings one might hypothesize that causality orientations could be distinguished from related dispositional traits, and further that causality orientations could be conceived of as characteristic adaptations of personality.

Since the previous study (Olesen et al., 2010) was inherently explorative and its data material originated in a student population, the current study will apply a strictly confirmatory strategy to a sample originating in a national probability sample. Developments concerning analysis strategy will be elaborated below.

The first model specified is shown in Fig. 1. It uses structural equation modeling (SEM) to estimate the measurement of factors (i.e., as in CFA) as well as standardized regression coefficients and R^2 values for the latent dimensions of general causality orientations onto latent personality traits. This one-step approach, in which measurement and structural aspects are estimated simultaneously, is recommended by Fornell and Yi (1992). Notably, the

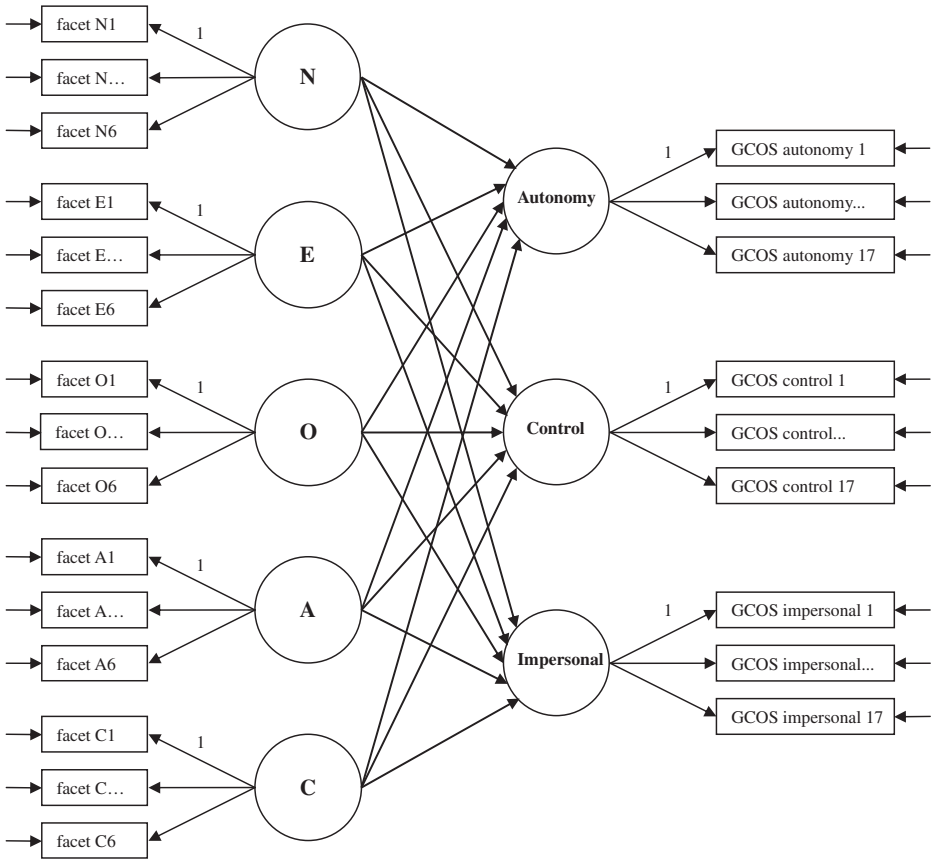

Fig. 1. Structural equation model. *Note:* Factors were scaled using unit loading identification constraints. N = neuroticism; E = extraversion; O = openness to experience; A = agreeableness; C = conscientiousness; GCOS = general causality orientations scale.

corresponding eight-factor CFA model has provided a reasonable fit before (i.e., in a post hoc analysis; Olesen et al., 2010, p. 542). Thereby additional requirements suggested by the alternative two-step approach are satisfied as well (Anderson & Gerbing, 1992). In opposition to the previous study (Olesen et al., 2010), the current SEM model and subsequent CFA models rely entirely on zero cross-loading indicators. Zero cross-loadings are more conservative and perhaps even over-constrained when estimating such complex models (Asparouhov & Muthèn, 2009). Nonetheless, the SEM model reflects the hypothesis that causality orientations can be distinguished as characteristic adaptations of personality. Support for this hypothesis would be indicated by the overall model fit.

The SEM model described above has another two primary advantages: (1) Regression coefficients are intended to provide a valid measure of the actual relationships in question. That is, regressions reflect a theoretical prediction of latent causality orientations by latent personality traits while accounting statistically for shared variance between traits (i.e., latent personality traits correlate considerably; Asparouhov & Muthèn, 2009). For example, latent extraversion and neuroticism are correlated so that it becomes necessary to account for their shared variance before examining relationships with impersonal (Koestner & Losier, 1996); (2) R^2 values for each of the latent causality orientations are intended to validate the overall conceptual distinction of orientations from traits. That is, the R^2 measures how much of the variance in each orientation may be explained by latent traits. Ideally, to serve this purpose R^2 values should be low, whereas higher values might be attributable to either conceptual overlaps and/or actual relationships between distinct but meaningfully related constructs.

Further, to test whether R^2 values are primarily attributable to either conceptual overlaps or actual relationships, subsequent pairs of competing CFA models are specified. Recall that control was somewhat overlapping with reversed agreeableness and that impersonal was somewhat overlapping with neuroticism (Olesen et al., 2010). Thus, the subsequent CFA models estimate whether expected two-factor or alternative one-factor structures for the latent dimension(s) of control and agreeableness as well as impersonal and neuroticism fit the data better. Also note that the previous study (Olesen et al., 2010) found no other significant conceptual overlaps that could be tested in the present study. Logically, if the two-factor models provide better fits, the hypothesis that causality orientations can be distinguished as characteristic adaptations of personality would gain support.

2. Method

2.1. Participants

Participants were 223 Danish adults (60.09% women; age $M = 43.74$, SD = 15.10). They had on average achieved 2.41 years of education past high school (SD = 2.29). Participants were among the responders in a recent validation study (i.e., Horowitz, 2008). The response rate was 79.36%. In comparison to the Danish population, women were overrepresented in the current sample, further participants were on average 3 years younger and they had received 2.51 years longer education (Horowitz, 2008).

2.2. Recruitment

Participants were recruited from a Danish national probability sample that had originally been drawn by a batch of random social security numbers. Recruitment took place in cooperation with Hogrefe Psychological Publishers. The publishing company provided contact information and e-mail addresses for potential participants. The researcher sent out invitations.

Table 1
Means, standard deviations, and Cronbach's α for NEO-FFI and GCOS.

	M	SD	α
NEO-FFI			
Neuroticism	19.63	8.14	.86
Extraversion	30.63	7.23	.85
Openness to experience	28.38	7.04	.78
Agreeableness	33.78	6.34	.79
Conscientiousness	32.93	6.62	.82
GCOS			
Autonomy	100.90	9.34	.81
Control	65.78	12.77	.79
Impersonal	60.86	14.42	.85

Note: $N = 223$. NEO-FFI = NEO five-factor inventory. GCOS = general causality orientations scale.

2.3. Materials

Background information such as sex, age, and education, was assessed. Dispositional traits were measured by the Danish NEO-five-factor inventory (NEO-FFI; Costa & McCrae, 2004). NEO-FFI assesses FFM traits. The 60 items consist of general personality statements accompanied by 5-point Likert scales that range from *strongly disagree* to *strongly agree*. Internal reliability for NEO-FFI traits is reported in Table 1.

General causality orientations were measured by the extended GCOS (Deci & Ryan, 1985; Ryan, 1989; for Danish translation see Thomsen, Tønnesvang, Schnieber, & Olesen, 2011, study 1). This version assesses autonomy, control, and impersonal orientations by 51 items, which are arranged in groups of three within 17 vignettes. Vignettes describe psychosocial challenges (e.g., having just been turned down for a job). Items describe prototypical responses with respect to autonomy, control, and impersonal. Items are accompanied by 7-point Likert scales, which range from *very uncharacteristic* to *very characteristic*. The full questionnaire is available online at the SDT web-site (2011): http://www.psych.rochester.edu/SDT/measures/GCOS_17.php. Internal reliability for GCOS orientations is reported in Table 1.

2.4. Procedure

The invitations provided participants with a personal link to electronic questionnaires (including other questionnaires not relevant to the present study), which were estimated in the instructions to have a one-hour completion time. Reminders were sent out to non-responders after 1 and 3 weeks. After 3 weeks non-responders received a telephone-call. Questionnaires were closed after 5 weeks. The software was set not to accept missing data. Participants who completed all questionnaires were rewarded with a modest gift valued at $30, specifically two movie theatre tickets or two bottles of red-wine.

2.5. Analysis

Initially, one SEM model was specified and estimated by maximum likelihood analysis of sample variances and covariances. The software used was Lisrel 8.8 (Jöreskog, Sörbom, Du Toit, & Du Toit, 2001). As shown in Fig. 1, NEO-FFI factors each were indicated by six parcels (i.e., summed pairs of facet-loading items in the FFM[1]; Costa & McCrae, 2004), whereas GCOS factors each were indicated

[1] The Danish translation of NEO-FFI consists of the two items with the highest second order facet-loadings (30 pairs) from the NEO Personality Inventory – Revised (Costa & McCrae, 2004).

by 17 non-parceled items. The 81 observed variables amounted to 3321 observations while 187 free parameters were estimated (i.e., for exogenous factors 5 variances and 10 covariances, for observed variables 81 measurement errors and 73 loadings, for endogenous factors 15 direct effects and 3 disturbances). In sum, the model has 3134 degrees of freedom, meaning that the current study tests a both complex and restrictive model (Asparouhov & Muthèn, 2009), which in turn generates some issues.

One obvious issue is power. The current sample size is small relative to the degrees of freedom and free parameters. Thus, a post hoc power analysis was performed (MacCallum, Browne, & Sugawara, 1996). Related to that note, another issue is model-reliability, again due to sample size and complex modeling. Thus to cross-validate the model, a statistical re-sampling procedure was adopted (i.e., standard bootstrapping by replacement; Bollen & Stine, 1992). In addition, the bootstrapping was intended to address non-normality issues of the Likert type data. The overall fit and power of the SEM model as well as the fit of equivalent bootstrapped models were evaluated before interpreting regression coefficients and R^2 values.

Several goodness-of-fit indices along with their corresponding bootstrapped means and 95% confidence intervals were used to evaluate the SEM model: χ^2 test, the incremental comparative fit index (CFI; Bentler, 1990) and absolute values in the root means square error of approximation (RMSEA; Steiger, 1990) and standardized root mean square residual (SRMR; Jöreskog et al., 2001). It has been suggested that an acceptable fit is indicated by a significant χ^2, CFI > .95, RMSEA < .06, and SRMR < .08 (Hu & Bentler, 1999). Nonetheless, Hu and Bentler (1999) made specific notice that under conditions of a small sample size (N < 250), a complex model, and non-multivariate normality, these values may be relaxed. Thus, in the present study model-specific evaluations are preferable to fixed criteria (Hu & Bentler, 1999; Marsh, Hau, & Wen, 2004). In sum, the SEM model may provide a reasonable approximation of the data given a CFI > .85, RMSEA < .08, and SRMR < .10.

In extension of the SEM model, bootstrapping and the previous study (Olesen et al., 2010), the following competing pairs of CFA models were specified, estimated and evaluated by terms similar to those described above. Yet these models were specified to estimate specific pairs of one nested factor or two separate factors limited to control and agreeableness as well as limited to impersonal and neuroticism. To compare these models, the expected cross validation index (ECVI; Browne & Cudeck, 1989) was assessed and supplemented by a χ^2 difference test. Lower ECVI values along with a reasonable approximation of the data indicate which models fit the data better.

3. Results

Means and standard deviations for NEO-FFI and GCOS subscales are reported in Table 1. To confirm the hypothesis that causality orientations can be distinguished as characteristic adaptations of personality, an eight-factor SEM model was specified. According to the relaxed criteria, the model provided a reasonable approximation of the data ($\chi^2(3134) = 6093.89$, $p < .001$; CFI = .86; RMSEA = .065; SRMR = .096). Attending to the power issue, a post hoc analysis for the RMSEA value established adequate power for tests of not-close fit (Gnambs, 2011; MacCallum et al., 1996). In a further attempt to cross-validate the model, statistical re-sampling was adopted. However, the bootstrapped means of fit indices and 95% confidence intervals indicated a poor fit[2] ($\chi^2(3134) = 9206.70$ [9175.93; 9237.39], all p's < .001; CFI = 0.70 [.70; .71]; RMSEA = .093 [.093; .094]; SRMR = .11 [.11; .11]). The poor bootstrapped fit could possibly be attributed to misspecifications in the model and/or sample peculiarities. Nonetheless, cross-validating the SEM model failed.

Attending to misspecifications due to measurement aspects, a residual analysis for the SEM model was performed. When plotting the standardized residuals in a frequency histogram, as shown in Fig. 2, they turned out to be evenly distributed around values close to zero (range [−7.73; 6.18], M = .11, SD = 1.66), although 11.57% of them exceeded the expected 1% margin of error. Since the large residuals in general were associated with all observed variables, one identifier of misspecifications in the model could be to examine variables involved in both overestimation and underestimation (i.e., extreme negative and positive residuals). A few variables were involved in this gross pattern (control items gcos4c, gcos9c, extraversion facet E2, and openness facet O1). In addition, one variable was involved in marked overestimation (i.e., extreme negative residuals; impersonal item gcos15b), whereas a couple of variables were involved in marked underestimation (i.e., extreme positive residuals; Control item gcos11b, impersonal item gcos1a, and extraversion facet E1). In sum, the frequency of large residuals suggested some misspecifications, while examining the variables involved offered no further guidance.

One strategy then, could be to improve the fit by specifying cross-loadings as a general principle (e.g., Olesen et al., 2010), or by following modification indices and freeing suggested error term correlations. These strategies would however, defer the confirmatory purpose of the current study (Asparouhov & Muthèn, 2009), and increase the risk of capitalizing on chance (MacCallum, Roznowski, & Necowitz, 1992). Instead, the initial analysis strategy was resumed.

To further uncover misspecifications, the standardized loadings were examined. All loadings for NEO-FFI parcels were significant (p < .001, range [.31; .85], M = .61), indicating that the measurement of personality trait factors was satisfactory. Loadings for GCOS autonomy items were also significant (p < .001 and p < .05 for gcos4b, range [.24; .65], M = .47). Whereas most loadings for control items were significant (p < .05, range [.22; .60], M = .45), exceptions were gcos1b and gcos6a, while gcos11b barely reached significance. All loadings for impersonal items were significant (p < .001 and p < .05 for gcos12c, range [.16; .63], M = .50). Taken together, the measurement of causality orientation factors was marked by a few misspecifications, particularly in the control factor.

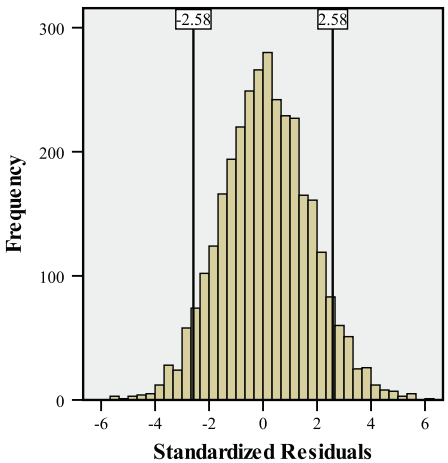

Fig. 2. Histogram. *Note:* Standardized residuals express (i.e., by normal deviate Z-scores) the discrepancy between the model-implied covariance matrix and the sample covariance matrix. The reference lines indicate a 1% margin of error.

[2] Out of 1000 bootstrapped samples with a fraction of 100%, 57 samples were excluded from the results due to non-admissibility and non-convergence when fitting the models. Thus, the final bootstrapped N = 943.

Table 2
Standardized regression coefficients and R^2 values for the latent GCOS dimensions onto latent NEO-FFI dimensions.

Latent factor	NEO-FFI					R^2
	N	E	O	A	C	
GCOS						
Autonomy	.13	.22*	**.30***	.25*	.14	**.31**
Control	.22	−.07	−.28*	**−.54***	.13	**.55**
Impersonal	**.56***	**−.38***	−.26*	−.06	−.12	**.72**

Note: N = 223. Coefficients above .30 are given in boldface. NEO-FFI = NEO five-factor inventory. N = neuroticism; E = extraversion; O = openness to experience; A = agreeableness; C = conscientiousness; GCOS = general causality orientations scale.
* $p < .05$.

For interpretation of relationships between causality orientations and traits, standardized regression coefficients and R^2 values for the latent GCOS dimensions onto NEO-FFI dimensions are reported in Table 2; their corresponding bootstrapped means and confidence intervals were omitted, since they were in essence identical. The regression coefficients were in agreement with previous research (e.g., Olesen et al., 2010). However, when examining the R^2 values traits did not leave much unexplained variance in control and particularly impersonal orientations. In consideration of the poor bootstrapped fit, this calls for additional analyses.

Competing CFA models were specified to test whether an expected two-factor or an alternative one-factor structure for the latent dimension(s) of control and agreeableness would fit the data better. The two-factor model for GCOS control and NEO-FFI agreeableness provided a reasonable approximation of the data ($\chi^2(229) = 429.67$, $p < .001$; CFI = .91; RMSEA = .063 [.054; .072]; SRMR = .069; ECVI = 2.36), while the alternative one-factor model provided a poorer fit ($\chi^2(230) = 533.94$, $p < .001$; CFI = .88; RMSEA = .077 [.069; .086]; SRMR = .075; ECVI = 2.82), due to a higher ECVI value and a significant χ^2 increase ($\chi^2(1) = 104.27$, $p < .001$). This result supports a conceptual distinction between control and agreeableness.

Likewise, two CFA models were specified to test whether an expected two-factor or an alternative one-factor structure for the latent dimension(s) of impersonal and neuroticism would fit the data better. The two-factor model for neuroticism and impersonal provided a reasonable approximation of the data ($\chi^2(229) = 517.53$, $p < .001$; CFI = .95; RMSEA = .075 [.067; .084]; SRMR = .071; ECVI = 2.75), while the alternative one-factor model provided a poorer fit ($\chi^2(230) = 797.14$, $p < .001$; CFI = .91; RMSEA = .011 [.097; .11]; SRMR = .082; ECVI = 4.01), due to a higher ECVI value and a significant χ^2 increase ($\chi^2(1) = 279.61$, $p < .001$). This result supports a conceptual distinction between impersonal and neuroticism.

4. Discussion

This study indicates that individual differences in SDT can be distinguished from the FFM of dispositional traits. A SEM model applied to a sample of Danish adults showed that latent dimensions of general causality orientations (GCOS) are distinct from but related to latent personality traits (NEO-FFI). However, an attempt to cross-validate the model by statistical re-sampling failed. This reliability issue could be due to misspecifications, primarily attributable to the measurement of causality orientation factors. Another possibility is that sample-specific peculiarities could have been enhanced when the replacement procedure was applied, which in turn influence the bootstrapped fit indices (Bollen & Stine, 1992). This could mean that the model is capitalizing on chance in the current sample. Thus, in addition to the following considerations, another replication of the SEM model seems warranted.

Since traits do not leave much unexplained variance in control and particularly impersonal orientations, specific analyses of two pairs of competing CFA models confirm the conceptual distinction between causality orientations and traits. Autonomy is related to extraversion, openness, and agreeableness. Control is related to reversed agreeableness and reversed openness. Impersonal is related to neuroticism and reversed extraversion and reversed openness. Thus, this study strengthens existing literature (Deponte, 2004; Koestner & Losier, 1996; Lynch et al., 2009; Olesen et al., 2010; Sheldon et al., 1997) and replicates that causality orientations are related to openness to experience (Hodgins, Yacko, & Gottlieb, 2006). It appears that degrees of internalized self-regulation and perceived locus of causality are related to dispositional tendencies towards a vivid imagination, tolerance of ideas and emotions, and self-fulfilling activities, which are encompassed by openness.

Given that general causality orientations and dispositional traits can be distinguished, integrative personality frameworks provide a sound theoretical interpretation. That is, causality orientations can be viewed in terms of motivational, social-cognitive, and developmental adaptations of dispositional traits (McAdams & Pals, 2006). This means that causality orientations are characteristic adaptations of personality, and thereby they should be influenced by both dispositional traits and by contingencies in psychosocial contexts (Hodgins et al., 2006; Lynch et al., 2009; Sheldon et al., 1997). These studies augment the results found in the present study and the proposal that causality orientations can be conceived of as characteristic adaptations. Though on a critical note, there is still a need to establish developmental causality of these relationships in longitudinal research.

Extending on the proposal that causality orientations are characteristic adaptations, one might speculate that these adaptations could add to or even influence relationships between dispositional traits and the dependant variables that are shared with orientations. For example, both traits and causality orientations are known to predict well-being states; extraversion and autonomy predict well-being, whereas neuroticism and impersonal predict ill-being (Deci & Ryan, 1985, 2000; McCrae & Costa, 2008). Thus, autonomy might add to or influence the extraversion and well-being relationship, whereas impersonal might add to or influence the neuroticism and ill-being relationship. The point is that traits viewed as "causal" dispositions can be integrated with the view that psychosocial environments influence trait expressions through characteristic adaptations such as causality orientations (Hodgins et al., 2006; Lynch et al., 2009; Sheldon et al., 1997). This line of thought and future empirical support would move the science of integrative personality psychology forward.

4.1. Limitations

Note that the theoretical directionality of regressions in the SEM model suggests that causality orientations are influenced by traits, although the data are cross-sectional and do not provide such information. Further, participants who completed questionnaires received a gift, which may have caused distorted responses in order to receive the incentive (Viswesvaran & Ones, 1999). However, results replicate a previous study (Olesen et al., 2010), in which respondents did not receive a gift, indicating that distorted responses are not an issue in the present study.

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