Longitudinal trajectories of passion and their individual and social determinants: A latent growth modeling approach

István Tóth-Király[1,2,*], Beáta Bőthe[1,2], Miriam Jánvári[3], Adrien Rigó[2], Gábor Orosz[4,2]

[1] Doctoral School of Psychology, ELTE Eötvös Loránd University, Budapest, Hungary
[2] Institute of Psychology, ELTE Eötvös Loránd University, Budapest, Hungary
[3] Institute of Applied Human Sciences, University of Nyíregyháza, Hungary
[4] Department of Psychology, Stanford University, Stanford, CA, USA

*Corresponding author
István Tóth-Király
Institute of Psychology, ELTE Eötvös Loránd University
Izabella utca 46.
Budapest, H-1064, Hungary
E-mail.: tothkiralyistvan@gmail.com; toth-kiraly.istvan@ppk.elte.hu

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Abstract

While the Dualistic Model of Passion posits that passion can fluctuate over time, the investigation of this notion still remains understudied and is mostly assessed indirectly. This study directly examined the ongoing development of passion in a sample of young adults (N = 205) over a period of four months. The contribution of individual (need fulfillment) and social (perceived parental styles) determinants to the growth trajectories were also considered. Via latent growth modeling, the results showed that harmonious passion, obsessive passion, and the passion criteria had elevated levels at the initial measurement, and that passion remained high and stable over the course of four months. As for the predictors, parental autonomy-support predicted all three trajectories, while parental overprotection predicted obsessive passion, and psychological need fulfillment predicted harmonious passion. These findings provide a deeper insight into the temporal dynamics of passion as well as highlight key variables for fostering passion in general or harmonious passion as well as for taming obsessive passion.

Keywords: development; Dualistic Model of Passion (DMP); latent growth modeling (LGM); longitudinal; parenting style; psychological need fulfillment

Introduction

Prior decades of psychological research have put increasing emphasis on the identification of constructs that positively contribute to people's lives; this is essentially the goal of positive psychology (Seligman & Csíkszentmihályi, 2000). Of major relevance to positive psychology is passion which has been proposed as being such a construct. According to the Dualistic Model of Passion (DMP; Vallerand, 2015; Vallerand et al., 2003), it is defined as a strong inclination towards a specific activity that the person loves and enjoys, values, incorporates into his/her identity, and spends a significant amount of time and energy with it. Apart from the general passion construct (called passion criteria, PC), the DMP also differentiates between harmonious (HP) and obsessive passion (OP) on the basis of the internalization process that occurs during activity engagement. Stemming from autonomous internalization, people become harmoniously passionate when they engage in a loved activity for its own sake and inherent characteristics (e.g., it is satisfying). In this case, people decide when and how to engage in the activity. As for OP where controlled internalization is present, the activity is still loved, but it overwhelms the individual who partakes in it due to experiences of intra- or interpersonal pressures, leading to loss of control and rigid engagement. Previous studies generally supported the association between HP and adaptive outcomes as well as OP and maladaptive outcomes (e.g., Carbonneau, Vallerand, Fernet, & Guay, 2008; Lalande et al., 2017; Orosz, Vallerand, Bőthe, Tóth-Király, & Paskuj, 2016; see also Curran, Hill, Appleton, Vallerand, & Standage, 2015). While the DMP also describes the ongoing development of passion (i.e., when the passionate activity is not engaged for the first time or in a new context), this has never been explicitly tested in research. Still, it is cardinal to examine the longitudinal development of passion for its more comprehensive understanding. This has also been reinforced by prior calls for longitudinal studies within passion research (Vallerand, 2015). Apart from investigating passion changes over time, the present study also considered theoretically-relevant individual (i.e., specific need fulfillment) and social (i.e., perceived parental styles) factors that are thought to influence this development.

Temporal Dynamics of Passion

Vallerand (2015) describes passion as being malleable and the development of passion as being an ongoing process. The amount of passion and the type of passion one has might change or fluctuate over a certain period of time depending on the form of internalization one experiences. Interestingly, the direct examination of the temporal dynamics of passion has not been in the focus of research despite the fact that these investigations could provide important information about its nature. Still, indirect evidence coming from previous studies employing autoregressive models (e.g., Carbonneau et al., 2008; Fernet, Lavigne, Vallerand, & Austin, 2014; Lalande et al., 2017; Lavigne et al., 2012) suggest that prior harmonious and obsessive passion scores had a moderate-to-strong predictive effect on subsequent passion scores, thus passion appears to be moderately stable over time.

However, one limitation of these studies, from the perspective of passion trajectories, is the use of said autoregressive models (ARM; Bollen & Curran, 2004). This approach rests on the

assumption that the current value of a given variable is determined by its corresponding past value in an additive way. Accordingly, ARMs do not assess change directly, but rather indirectly of autoregressions (or auto-predictive effects) and the time-specific residual variances. These effects are interpreted as being the same for all individuals in a given sample. A suitable alternative is latent growth modeling (LGM; Bollen & Curran, 2006) which focuses on individual trajectories of change over time that are summed into a mean growth trajectory. An advantage of this approach is that it does not only examine stability over time, but development as well (i.e., increases or decreases over time). For instance, it is possible that a construct remains stable over time (i.e., people with prior higher scores retain higher scores, while people with prior lower scores retain lower scores), while still demonstrating development (i.e., everyone's score in the sample decreases). Thus, a strength of LGMs is that they provide a direct way to investigate *true* changes over time (see the online supplements for more details).

Predictors of Passion Trajectories

The development of passion is thought to be a function of individual and social factors (Vallerand, 2015) among which need fulfillment is of major relevance. Need fulfillment stems from Self-Determination Theory (SDT; Ryan & Deci, 2017) which describes three basic psychological needs (i.e., need for autonomy, need for competence, and need for relatedness) that are cardinal for achieving psychological health, optimal functioning, and a complete (instead of partial) internalization process (Deci & Ryan, 2000; Vansteenkiste & Ryan, 2013). The DMP also supports this notion from the perspective of passion, highlighting that experiences of need fulfillment in a relevant life contexts—such as education, work or sport—are necessary to achieve a more optimal internalization process (i.e., autonomous) which might lead to HP. Conversely, unfulfilled needs might be conductive of suboptimal internalization processes (i.e., controlled), leading to OP. While previous studies have investigated the association between need fulfillment and passion (e.g., Lalande et al., 2017), the impact of need fulfillment on temporal passion changes remain understudied.

A particularly important distinction has to be made between general and specific need fulfillment. General need fulfillment refers to one's need-related experiences in life in general, while specific need fulfillment describes one's need-related experiences in a specific and important life domain such as work, school, or sports. Previous studies suggest that greater general or specific need fulfillment is positively associated with wellbeing and optimal functioning (see Ryan & Deci, 2017). One potential indicator of functioning might be passion given its harmonious and obsessive aspects referring to optimal and suboptimal functioning, respectively (see Yu, Chen, Levesque-Bristol, & Vansteenkiste, 2018 for an applicable process model). However, the majority of these studies have investigated these associations between variables that are within the same domain (e.g., general need fulfillment and general wellbeing or need fulfillment during sports and passion for sports).

Based on the findings of Lalande et al. (2017), we assumed that having unfulfilled needs in an important life domain might be associated with compensation in another domain or in a specific situation. That is, when one's needs are frustrated in an important life domain (e.g.,

work), this individual might start to "overengage" in a behavior pertaining to another life domain. Our proposition is also in line with Vansteenkiste and Ryan (2013) in that when psychological needs are obstructed, people are more likely to engage in compensatory behaviors to cope with this deficient state. One of the compensatory behaviors might be rigidly engaging in a certain activity that is thought to be able to provide a sense of structure and security (Vansteenkiste & Ryan, 2013). Examining domain-specific need fulfillment in relation to a passionate activity in a different domain also complements previous studies that solely examined how specific need fulfillment is related to general wellbeing (e.g., Baard, Deci, & Ryan, 2004; Milyavskaya et al., 2009; Milyavskaya, Philippe, & Koestner, 2013; Slemp & Vella-Brodrick, 2014), but not to various ways of functioning.

Apart from individual characteristics, the social environment also represents an important determinant of passion. Research on passion has only marginally focused on the role of perceived parenting styles (i.e., care, overprotection, and autonomy-support) despite the fact that these styles are thought to have great relevance for early and later human functioning as well (Bowlby, 2008; Drake, Belsky, & Fearon, 2014). So far, the DMP mostly underscored the importance of autonomy-support not just in the initial, but also in the ongoing development of passion. By behaving in an autonomy-supportive way, the social environment (e.g., parents or family) might facilitate the autonomous internalization of the liked activity which might lead to HP, while parental control might contribute to controlled internalization and, in turn, OP (Bonneville-Roussy, Vallerand, & Bouffard, 2013; Mageau et al., 2009). Additionally, evidence coming from research on developmental psychology suggested that negative parenting practices (i.e., higher overprotection and lower parental care) have been associated with problematic behaviors such as internet addiction or pathological gambling (e.g., Grant & Kim, 2002; Lin, Lin, & Wu, 2009) which are similar to OP (e.g., Kovacsik et al., 2018; Tóth-Király, Bőthe, Tóth-Fáber, Hága, & Orosz, 2017). Overall, it appears that both need-based experiences and perceived parenting styles predict passion. Still, no previous study has investigated their potential effect on passion growth trajectories.

The Present Investigation

The present study sought to provide further insight into the temporal dynamics of passion by directly examining the potential changes in HP, OP, and PC over the course of four months, thus contributing to a deeper understanding of passion. More specifically, with latent growth modeling, we investigated (1) the magnitude of mean initial values for HP, OP, and PC; (2) the presence of change over time; (3) the magnitude of this change; and (4) the effect of theoretically-relevant variables on the passion trajectories in the form of specific need fulfillment and perceived parenting styles of care, autonomy-support and overprotection.

Materials and Methods

Procedure and Participants

The research was approved by the University Research Ethics Committee of the Eötvös Loránd University and was conducted in accordance with the Declaration of Helsinki. For the

purpose of this study, a Hungarian university, situated in the countryside, was contacted for participation. Consent was obtained from the president of the university, the professors, and the participants. They received information about the purpose of the study, and that participation was voluntary and confidential. They did not receive any compensation for participation and they also provided written consent. Data gathering occurred during a four-month period from February 2018 (the beginning of the academic semester) to May 2018 (the end of the academic semester) where participants filled out paper and pencil questionnaires monthly. A total of 205 adult university students (64.4% female), aged between 19 and 41 (M = 22.14, SD = 2.54), participated in this study. The majority of them (82.4%) had a higher education degree, 42.9% lived in city with an additional 36.1% living in villages. The rational for this sample size was anchored in two reasons. First, practical limitations prevented us from recruiting participants from a larger initial pool. Second, previous studies reported that LGM models should include at least 100 participants (Curran, Obeidat, & Losardo, 2010; Hamilton, Gagné, & Hancock, 2003), with around 200 or more being preferable for 15 observed variables (Muthén & Muthén, 2002; Park & Schutz, 2005). Given that our models included eight observed variables (see below), 205 participants appeared to be satisfactory for the present case. Overall, the 205 participants completed a total of 600 time-specific questionnaires with 83.9% of participants provided at least 2 out of the 4 waves of data.

Measures

   Passion. At each wave, the Hungarian version (Tóth-Király, Bőthe, Rigó, & Orosz, 2017) of the Passion Scale (Marsh et al., 2013; Vallerand, 2015) was used which measures harmonious passion (HP; 6 items, e.g., "My activity is in harmony with other things that are part of me"), obsessive passion (OP; 6 items, e.g., "This activity is the only thing that really turns me on"), and the passion criteria (PC; 5 items, e.g., "This activity is important for me"). Participants were asked to think of an activity that was the dearest to their hearts (i.e., corresponded to the criteria of passion of a loved activity which is personally important and on which they spend significant amount of time and energy) and fill out the questionnaire about this activity. This decision ascertained that respondents were indeed passionate for their activities as opposed to being provided with an activity that they might or might not be passionate for. For instance, they were reportedly passionate for sports, being with their family or friends, cooking, or music. Participants reported the same activity at each time-point. Response options ranged on a seven-point scale (1 = not agree at all; 7 = very strongly agree).

   Basic psychological need fulfillment. At Time 1, the Hungarian version (Tóth-Király, Bőthe, Orosz, & Rigó, 2018; Tóth-Király, Morin, Bőthe, Orosz, & Rigó, 2018) of the 24-item Basic Psychological Need Satisfaction and Frustration Scale (Chen et al., 2015) was used to measure need fulfillment. This instrument measures a total of six factors (representing need satisfaction and need frustration × autonomy, competence, and relatedness). Due to recent empirical results (see online supplements), need frustration was reversed and a general need fulfillment factor was used. Given that the educational context was a highly relevant one for the recruited participants, we slightly modified the instruction and the items so that they pertained to

need-based experiences at the university. Items were rated on a five-point scale (1 = Not true at all for me; 5 = Very true for me).

Perceived parental styles. Also at Time 1, the Hungarian version (Tóth & Gervai, 1999) of the Parental Bonding Inventory (Parker, Tupling, & Brown, 1979) was administered which is a 25-item self-report instrument in which one has to recall experiences about parental practices and behaviors during the first 16 years of life. The questionnaire measured three parenting behaviors: care (12 items, e.g., "Spoke to me with a warm and friendly voice"), autonomy (6 items, e.g., "Let me dress in any way I pleased"), and overprotection (7 items, e.g., "Tried to make me dependent on him"). Items were rated on a four-point scale (1 = very like this; 4 = very unlike this).

Statistical Analysis

Data was first analyzed in SPSS 22 for preliminary analyses (e.g., demographics of the participants, estimation of means, standard deviations, internal consistency, and correlations). A particularly important challenge of research is to handle missing data which is inherent to longitudinal designs. To investigate the pattern of data missingness, Little's MCAR (Little, 1988) test was performed in SPSS where a non-significant value would suggest that data is indeed missing completely at random. Results supported the null hypothesis, $\chi^2(512) = 102.274$, p = .337, indicating that missing data is MCAR. For this reason, full information maximum likelihood (FIML) was used for the handling of missing values for the main analyses. This decision was based on the previous studies showing that FIML outperforms alternative methods (e.g., listwise deletion or multiple imputation) in treating missing data (Enders, 2010; Enders & Bandalos, 2001; Graham, 2009, Jeličič, Phelps, & Lerner, 2009; Larsen, 2011) as missingness is treated as being conditional on all variables included in the analyses, but not on variables that are missing. Put differently, FIML uses all available information to estimate parameters for the model.

Subsequent analyses were conducted in Mplus 8.1 (Muthén & Muthén, 1998-2017) with the robust maximum likelihood estimator (MLR) to account for the potential non-normality of the data. To assess the longitudinal trajectories of passion, latent growth modeling (LGM; Bollen & Curran, 2006) was performed in which two growth factors were estimated: an intercept factor (set to 1 for all time-points as per typical specifications; Geiser, 2012) and a linear slope factor (coded in unit increments of 0-1-2-3 to reflect the monthly interval between the repeated measures)[1]. The intercept reflects the mean initial value, while the slope reflects the change over time. Time-invariant predictors were then incorporated into the models and were allowed to influence the growth factors. Models were estimated for HP, OP, and PC separately and with manifest variable indicators (mean scale scores) to avoid unnecessary model complexity relative to the sample size.

The adequacy of the models was evaluated with commonly used goodness-of-fit indices: the comparative fit index (CFI), the Tucker–Lewis Index (TLI), and the root mean square error of

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[1] Alternative quadratic and cubic models were also tested, but most of these failed to converge or had parameterization issues, suggesting that these growth changes might not be appropriate for the present data.

approximation (RMSEA) with its 90% confidence interval. According to typical interpretation guidelines (e.g., Hu & Bentler, 1999; Marsh, Hau, & Grayson, 2005), values greater than .90 and .95 for the CFI and TLI, respectively, are considered to represent adequate and excellent fit to the data, whereas values smaller than .08 or .06 for the RMSEA, respectively, indicate acceptable and excellent model fit.

Results

Descriptive statistics, internal consistency indices, and inter-factor correlations across the four time-points are reported in Table S1 of the online supplements. Goodness-of-fit indices for all estimated models are reported in Table 1. These results showed that all LGM models had good fit to the data (CFI and TLI > .950, RMSEA < .080). Parameter estimates for these models are reported in Table 2, and the average trajectories are graphically presented in Figure 1. These results revealed highly similar information across HP, OP, and PC. The mean intercept factors were significant, but the mean linear slope factors were non-significant, suggesting that passion levels remained relatively high and stable for HP and PC as well as moderate and stable for OP. The significant variance parameter of the intercept showed inter-individual variability, suggesting that individual trajectories significantly differed from one another around the estimated mean trajectory. In addition, time-specific explained variances (R^2) indicated that the growth factors provided a relatively adequate depiction of the repeated passion measures, ranging from 39.1% to 90.8% for HP, 48.0% to 84.3% for OP, and 45.7% to 82.2% for PC.

The incorporation of the predictors revealed several effects which mostly pertained to the intercept factor which might be attributed to the fact that predictors were measured in Time 1 (Table 3). The intercept factor of HP was positively predicted by need fulfillment and parental autonomy. While the slope of HP was not significant, parental care still had a small positive effect on it. The intercept of OP was positively predicted by parental autonomy and overprotection, while the slope of OP was negatively predicted by parental autonomy, despite the slope being non-significant. Finally, the intercept of PC was positively predicted by parental autonomy[2].

Discussion

Examining the stability of passion developmental processes is essential to better understand how the experiences of being passionate for a self-defining activity fluctuates over a certain period of time. To date, little scientific attention has been paid to the identification of ongoing passion changes despite that these investigations could provide valuable information on understanding developmental trajectories and on how to cultivate and foster passion which is thought to have several positive consequences (see Curran et al., 2015; Vallerand et al., 2015). This study sought to explicitly test the ongoing development of passion across a four-month

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[2] Initial auxiliary analyses were also conducted to test whether respondents' gender was related to either the initial passion values or the trajectories in all three models. However, none of the standardized regression coefficients were significant for harmonious passion ($\beta_{intercept} = -.038$, $p = .710$; $\beta_{slope} = .056$, $p = .585$), obsessive passion ($\beta_{intercept} = -.065$, $p = .495$; $\beta_{slope} = -.256$, $p = .061$), or the passion criteria ($\beta_{intercept} = -.086$, $p = .394$; $\beta_{slope} = .083$, $p = .518$).

period and, more importantly, offered to gain insight into the key individual and social determinants of this development. Moreover, the present study answered prior call for an increased focus on longitudinal passion research (Vallerand, 2015).

Overall, all three forms of passion (harmonious passion, obsessive passion, and passion criteria) had elevated initial values, suggesting that participants were highly passionate. None of the slope factors were significant, indicating that passion levels remain high and stable. These findings are in line with prior studies which used ARMs which indirectly measured change (e.g., Carbonneau et al., 2008; Lalande et al., 2017). Interestingly, Mageau et al. (2009) examined the initial development of passion (i.e., respondents who experienced the activity for the first time) and found that 35% of the children developed a moderate level of passion for music after a 5-month period. On the other hand, Schellenberg and Bailis (2015) reported that academic passion changed very little over the course of a semester for most of the first-year students. It is possible that while first-year university students had previous experiences with academics and studying as an activity, they reported about their experiences in a relatively new context that is the university. These seemingly contradictory results might be indicative of an overarching developmental model: it is possible that while the initial development of passion in childhood or in early activity engagement (i.e., from being non-passionate to passionate) occurs more dynamically, the ongoing development among young adults is likely to be a slower process (Schellenberg & Bailis, 2015; Vallerand, 2015). The present study nicely complements those of Mageau et al. (2009) as well as Schellenberg and Bailis (2015) in that the former investigated the initial development of passion (from non-passionate to passionate), while the latter examined how passion for a previously engaged activity manifests in a new context. Adding to them, the present study provides a "snapshot" of the extent to which passion changes in a sample of participants who were thought to have been engaging in their activities for quite some time.

Adopting the theoretical perspectives of SDT (Ryan & Deci, 2017) and attachment theory (Bowlby, 2008), the present study demonstrated that individual and social factors also had independent effects on passion trajectories. Parental autonomy-support predicted HP, and PC. These results are consistent with other research (Bonneville-Roussy et al., 2013; Liu, Chen, & Yao, 2011; Mageau et al., 2009) showing that parental autonomy-support provides children with the opportunity to freely engagement in activities and fully experience them, leading to autonomous forms of engagement and, in turn, HP and PC. Somewhat surprisingly, autonomy-support also predicted OP which has not been reported in the above-mentioned previous studies. This discrepancy might be attributed to the fact that autonomy-support as measured by the PBI is akin to permissive or laissez-faire parenting style which is characterized by a lack of involvement and guidance from the part of the parents. On the other hand, typical SDT research interprets autonomy-support as the provision of constructive, positive feedback, clear rules and goals as well as the possibility of offering guidance and help when necessary (Soenens & Vansteenkiste, 2010). Prior studies have already linked permissive parenting with self-regulatory deficits (Piotrowsky, Lapierre, & Linebarger, 2013), problematic drinking (Whitney & Froiland, 2015) and other maladaptive behaviors (Mahdavi, Esmaeilpour, & Khajeh, 2013) which are similar to OP. Permissive parenting might provide too much freedom and might lack restrictions that could,

in turn, facilitate the initial development of obsessive passion. Overall, from the perspective of parents, it might be important to achieve balance in autonomy-support: while autonomy-support that includes parental involvement might be beneficial for passion, permissive autonomy-support that lacks said involvement might tip this balance in the favor or obsessive passion.

As expected, parental overprotection predicted initial levels of OP which align with the addiction-related literature (e.g., Grant & Kim, 2002) by demonstrating that negative parental practices (e.g., invading the children's privacy or trying to control them) are likely to hinder children in freely exploring the surrounding environment for various activities. In this case, when overprotected children eventually find a self-defining activity, it is more likely that they become over-engaged with it to counter the negative experiences. In addition, this overprotective environment might foster the development of controlled internalization, leading to OP.

At the same time, while not influencing changes in HP, parental care positively predicted the slope of HP. It appears that positive parental practices might be associated with HP by providing a sense of security that might allow the child to immerse in different activities and experience them for their own sake. A possible explanation might be that parental care involves practices (i.e., being affectionate, praising, or making the child feel better) that might satisfy the child's basic psychological needs, allowing for contingency-free activity exploration and engagement. Still, as no actual changes were observed in HP, these findings only provide tentative support for this proposition and the results should only be interpreted with caution.

Finally, basic psychological need fulfillment positively predicted initial HP levels (but not OP), further supporting the relevance of these needs in optimal functioning. Based on the SDT (Ryan & Deci, 2017), the DMP (Vallerand, 2015) posits that the internalization of an activity becomes complete when needs are fulfilled; that is, when people experience psychological freedom, effectiveness, and reciprocal care with other in a key life context, they are more likely to function in an autonomous way which is conductive of HP. This was contrary to our expectation related to the potential compensatory response of OP to unfulfilled needs (Lalande et al., 2017). It may be that the effect of positive experiences in an important life domain (i.e., fulfilled basic psychological needs) generalize to other aspects of life. Previous studies in the domain of sport have already reported that context-specific need fulfillment was significantly related to HP, but not—or even negatively—to OP (Curran, Appleton, Hill, & Hall, 2013; Verner-Filion & Vallerand, 2018). Interestingly, similar results emerged in the present study in spite that need fulfillment focused on a life domain (i.e., education) that was relevant for the participants, but passion itself was not related to academics. It appears that when basic psychological needs are fulfilled in an important life domain, people do not only engage in the corresponding activity with HP, but they might also engage in another self-defining activity with HP. Overall, it is possible to hypothesize that having satisfactory experiences in a significant life domain might "aid" participants in finding an activity in which they can engage in a harmonious and more optimal way.

This study made two important contributions to the passion literature. First, the data and the analyses provided a more complete picture about the stability and developmental trajectories

of passion. Second, the present findings extended prior studies by demonstrating the dual role of parental autonomy-support, and the importance of overprotection and parental care.

Notwithstanding these strengths, there are some limitations that need to be addressed. Participants were recruited from a single university which limits the generalizability of the findings. Sample size in the present study might also be considered moderate. Further studies are needed with more comprehensive samples (including more participants) to ascertain generalizability, possibly recruiting younger samples, given that adolescence might be a more sensible period than adulthood. The synthesis of previous (Mageau et al., 2009; Schellenberg & Bailis, 2015) and present findings suggests that the developmental process of passion is more complex as it appears to be a relatively malleable at a young age, but becomes more stable when one is older. Given that our sample only included university students, it would be equally important to recruit older individuals as they might have less opportunities in finding another self-defining activity compared to students. Future studies might aim to identify the exact point in this process over which the development slows down and passion becomes more stable. Although attrition did not appear to bias the results, future studies could employ additional strategies to increase participant retention (e.g., conduct research in an online setting, reminder messages). A larger sample size would also allow for the use of latent variables which are naturally corrected for measurement error.

Passion appears to remain stable across a four-month period, suggesting that replications should be made with more spaced intervals between the measurement phases, possibly ranging over a year or even more. It has to be noted that the predictors were mostly related to the initial levels of passion, but not to the growth factors, with the exception of harmonious passion and parental care. However, as no HP changes were observed, these findings should only be cautiously interpreted. Although predictors were only measured at Time 1 which might account for their effects mostly pertaining to the initial passion levels, it remains as a limitation. Apart from the selected predictors, other variables might also influence passion trajectories. These issues represent opportunities for further research. Finally, it might be a fruitful endeavor to more precisely map the frequency of engagement in the passionate activities (e.g., hours per week or years engaging in the activity) as these indicators might be important differentiators with respect to the initial versus ongoing developmental process.

Taken together, this research answers calls for longitudinal studies in understanding the ongoing development of passion and demonstrates that passion remains highly stable across a four-month period. At the same time, parental autonomy-support and overprotection as well as need fulfillment are relevant predictors of the passion trajectories. These findings entail a number of important practical implications: to foster passion (any forms), parents might need to be autonomy-supportive. For taming obsessive passion, parents might need to avoid being overprotective. For nourishing harmonious passion, the basic psychological needs in specific life areas might need to be fulfilled.

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Table 1

Goodness-of-Fit Statistics for the Estimated Models

	χ^2	df	CFI	TLI	RMSEA	90% CI of RMSEA
Latent Growth Models (intercept + slope)						
Harmonious passion	3.484	5	1.000	1.018	.000	.000-.080
Obsessive passion	11.336*	5	.965	.958	.079	.011-.141
Passion criteria	3.275	5	1.000	1.028	.000	.000-.078
Latent Growth Models with Predictors						
Harmonious passion	16.058	13	.978	.961	.037	.000-.089
Obsessive passion	17.850	13	.978	.962	.047	.000-.096
Passion criteria	14.166	13	.988	.980	.023	.000-.088

Note. χ^2: Robust chi-square test of exact fit; df: Degrees of freedom; CFI: Comparative fit index; TLI: Tucker-Lewis index; RMSEA: Root mean square error of approximation; 90% CI: 90% confidence interval of the RMSEA; *$p < .05$.

Table 2

Parameter Estimates for the Final Latent Growth Models

	Harmonious passion			
Growth parameters	Intercept factor		Linear slope factor	
Mean	5.559 (.069)**		-.022 (.031)	
Variance	.398 (.111)**		.073 (.029)*	
Standardized correlations	—			
Linear slope factor	-.002 (.247)		—	
Repeated measures	Time 1	Time 2	Time 3	Time 4
Proportion of explained variance (R^2)	.391 (.107)**	.489 (.107)**	.554 (.057)**	.908 (.105)**
	Obsessive passion			
Growth parameters	Intercept factor		Linear slope factor	
Mean	4.039 (.088)**		.020 (.034)	
Variance	.775 (.155)**		.062 (.035)	
Standardized correlations	—			
Linear slope factor	.076 (.266)		—	
Repeated measures	Time 1	Time 2	Time 3	Time 4
Proportion of explained variance (R^2)	.480 (.090)**	.541 (.061)**	.755 (.048)**	.843 (.073)**
	Passion criteria			
Growth parameters	Intercept factor		Linear slope factor	
Mean	5.724 (.073)**		-.024 (.030)	
Variance	.509 (.139)**		.056 (.030)	
Standardized correlations	—			
Linear slope factor	-.022 (.053)		—	
Repeated measures	Time 1	Time 2	Time 3	Time 4
Proportion of explained variance (R^2)	.492 (.117)**	.457 (.058)**	.534 (.064)**	.822 (.127)**

*Note.* Numbers in parentheses are standard errors.; *$p < .05$; **$p < .01$.

Table 3

Path Coefficients Between the Predictors and the Growth Factors

Predictors	Harmonious passion			
	Intercept factor		Linear slope factor	
	b (SE)	β (SE)	b (SE)	β (SE)
Need fulfillment	.489 (.150)**	.362 (.108)**	.014 (.075)	.024 (.130)
Parental care	-.149 (.161)	-.099 (.104)	.182 (.087)*	.285 (.142)*
Parental autonomy	.326 (.122)**	.264 (.103)**	-.105 (.063)	-.199 (.102)
Parental overprotection	.121 (.127)	.104 (.107)	.030 (.061)	.061 (.126)
Predictors	Obsessive passion			
	Intercept factor		Linear slope factor	
	b (SE)	β (SE)	b (SE)	β (SE)
Need fulfillment	-.206 (.196)	-.113 (.107)	-.016 (.095)	-.034 (.190)
Parental care	-.279 (.209)	-.137 (.104)	.110 (.093)	.203 (.189)
Parental autonomy	.655 (.171)**	.395 (.102)**	-.133 (.067)*	-.297 (.179)
Parental overprotection	.359 (.164)*	.230 (.101)*	-.071 (.062)	-.170 (.167)
Predictors	Passion criteria			
	Intercept factor		Linear slope factor	
	b (SE)	β (SE)	b (SE)	β (SE)
Need fulfillment	.281 (.180)	.192 (.117)	-.028 (.091)	-.061 (.196)
Parental care	-.102 (.175)	-.062 (.108)	.105 (.078)	.205 (.172)
Parental autonomy	.318 (.120)**	.238 (.100)*	-.056 (.056)	-.132 (.139)
Parental overprotection	.222 (.128)	.177 (.099)	-.002 (.053)	-.004 (.133)

Note. b: unstandardized regression coefficient; β: standardized regression coefficient; SE: standard error; *$p < .05$; **$p \leq .01$.

Figure 1

Passion trajectories
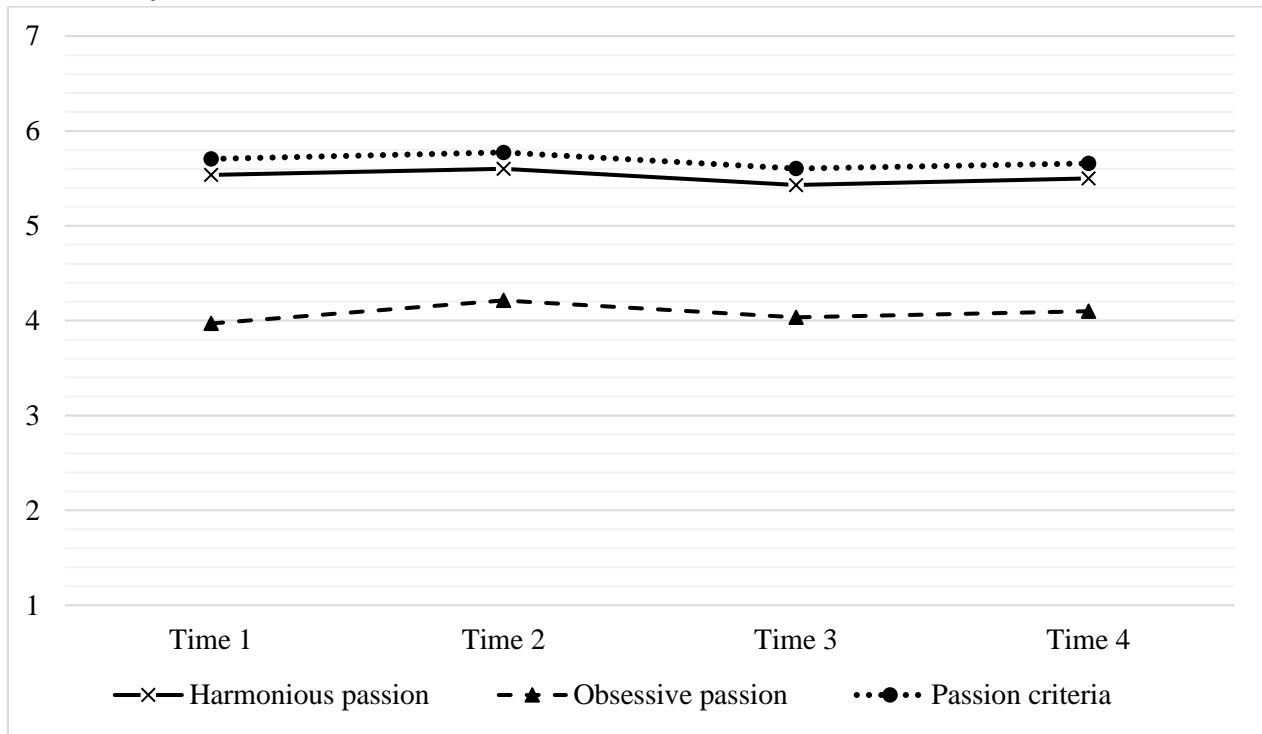
Note. Numbers on the horizontal axis represent time points, while numbers on the vertical axis represent the range of answer options for the Passion Scale. Models were estimated separately, but are depicted in the same figure for the sake of simplicity.

Online Supplements for:

Longitudinal trajectories of passion and their individual and social determinants: A latent growth modeling approach

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Appendix 1: Autoregressive and latent growth models

There have been several methods throughout research that have been used to analyze the stability of developmental processes such as correlational analysis, repeated measures analysis of variance, multivariate analysis of variance, and other methods (Curran, Obeidat, & Losardo, 2010; Morin, Maïano, Marsh, Janosz, & Nagengast, 2011). Two approaches that received considerable attention over the years have been the autoregressive modeling (ARM; Guttman, 1954; Jöreskog, 1979) and latent growth modeling (LGM; McArdle & Epstein, 1987; Meredith & Tisak, 1990). Both of these approaches have been widely used in psychological research (e.g., Arens et al., 2016; King, 2015; Morin et al., 2011; Morin et al., 2017; Putwain et al., 2018; Turner, Reynolds, Lee, Subasic, & Bromhead, 2014). However, there are fundamental differences between the two when one wishes to examine growth trajectories and change over time (see Figure S1 for a schematic representation of basic ARM and LGM models).

The main characteristic of ARM is that they assume that one's current behavior is best predicted by one's previous behavior (Geiser, 2012). For this reason, scores measured at Time 2 are regressed on scores measured at Time 1, scores measured at Time 3 are regressed on scores measured at Time 2, and so on. The strength of these autoregressive effect (i.e., regression coefficients) informs us about the stability of the construct at hand. In addition, residual variances are also to be examined to draw conclusions about temporal stability. High autoregressive effects in conjunction with low residual variances would suggest high temporal stability. Conversely, moderate-to-low autoregressive effects and high residual variances would suggest that the construct of interest changes over time. One can see that with ARM, growth is not directly assess, but *indirectly* and inferred from the magnitude of autoregressive and the time-specific residual variances. It is also important to note that, generally, ARM models are not used to investigate change over time, but rather to investigate the effect of other variables on the variable of interest (i.e., cross-lagged effects) over and above its previous score.

LGMs function differently as they produce latent trajectories or growth curves over time for the repeated measures (Bollen & Curran, 2004). The basic research question for LGMs is also distinct from that of the ARMs. Instead of examining the dependence of current passion levels on past passion level across all participants, LGMs assess an underlying developmental trajectory across the time points for all individuals (Bollen & Curran, 2006). These trajectories are assessed by estimating a latent intercept factor (i.e., mean initial value) and a latent growth factor (i.e., actual change rate over time). In other words, LGMs *explicitly and directly* focus on change over time. A strength of LGMs is that different types of growth factors (i.e., linear growth, quadratic growth, cubic growth, etc.) can be estimated when theory supports their potential presence (Bollen & Curran, 2006). Another important distinction between ARMs and LGMs is that the latter does not assume that all respondents have the same effect and allows individual variability and individual trajectories to be present. On the other hand, ARMs assume that change over time is the exact same for all individuals in the sample. Put differently, ARMs focus on group changes, while LGMs focus on individual changes (Voelkle, 2008). Given that our research question pertained to the temporal dynamics of passion, LGMs were deemed to be well-suited for the present investigation.

Appendix 2: On the issue of need fulfillment vs. need satisfaction and need frustration

There is currently an ongoing discussion within the field of Self-Determination Theory (SDT; Ryan & Deci, 2000; 2017) as to whether basic psychological need satisfaction and the later proposed need frustration are indeed empirically distinct, yet moderately associated factors, or rather these two dimensions are parts of the same underlying need fulfillment continuum with both taking up one extreme of said continuum. There have been some studies which provided support for the former proposition by demonstrating the distinctness of need satisfaction and frustration (e.g., Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011; Chen et al., 2015; Longo, Gunz, Curtis, & Farsides, 2016; Nishimura & Suzuki, 2016). On the other hand, other studies not just only suggested that need satisfaction and frustration are two endpoints of the same underlying continuum (Tóth-Király, Bőthe, Orosz, & Rigó, 2018; Tóth-Király, Morin, Bőthe, Orosz, & Rigó, 2018), but it was also demonstrated that need satisfaction and frustration show completely opposite pattern of associations with various correlates (Brenning, Soenens, Mabbe, & Vansteenkiste, 2018; Costa, Gugliandolo, Barberis, & Larcan, 2016; Landry et al., 2016; Schultz, Ryan, Niemiec, Legate, & Williams, 2015). In addition, a daily diary study reported that changes in need satisfaction and need frustration mirrored one another over the period of 8 days (Bidee, Vantilborgh, Pepermans, Griep, & Hofmans, 2016), supporting the continuum hypothesis. For these reasons, similar to previous studies (e.g., Campbell et al., 2016), we reversed the need frustration items and added them to the need satisfaction items to create a composite score of need fulfillment.

Table S1

Descriptive statistics, internal consistency indices, and inter-factor correlations

Variables	Range	M	SD	α	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. HP (T1)	1-7	5.55	1.01	.78	—														
2. HP (T2)	1-7	5.61	0.97	.79	.38**	—													
3. HP (T3)	1-7	5.50	1.10	.84	.32**	.50**	—												
4. HP (T4)	1-7	5.53	1.05	.84	.33**	.51**	.65**	—											
5. OP (T1)	1-7	3.95	1.26	.78	.35**	.19*	.07	-.01	—										
6. OP (T2)	1-7	4.22	1.25	.81	.13	.38**	-.13	.01	.45**	—									
7. OP (T3)	1-7	3.99	1.27	.82	.18	.24*	.16	.16	.55**	.70**	—								
8. OP (T4)	1-7	4.08	1.28	.82	.12	.23*	.01	.25*	.49**	.62**	.80**	—							
9. CP (T1)	1-7	5.74	1.02	.78	.62**	.28**	.18	.27**	.57**	.23**	.20*	.19*	—						
10. CP (T2)	1-7	5.82	1.02	.82	.34**	.70**	.30**	.35**	.25**	.42**	.32**	.21*	.43**	—					
11. CP (T3)	1-7	5.68	1.04	.83	.37**	.45**	.76**	.47**	.20*	.04	.37**	.27**	.32**	.38**	—				
12. CP (T4)	1-7	5.68	1.02	.80	.43**	.48**	.49**	.80**	.17	.11	.30**	.40**	.42**	.44**	.56**	—			
13. NE (T1)	1-5	3.90	0.47	.87	.22**	.24**	.15	.23*	-.13	-.08	-.13	-.13	.05	.22**	.08	.06	—		
14. CA (T1)	1-4	3.58	0.42	.86	-.07	.17*	.14	.14	-.14	.01	.09	-.07	-.05	.06	.17	.05	.19	—	
15. AU (T1)	1-4	2.83	0.52	.73	.11	.15	.23*	.04	.18*	.20*	.19*	.09	.11	.14	.19*	.09	.05	.24**	—
16. OV (T1)	1-4	1.88	0.55	.73	-.03	.04	-.01	.04	.19*	.06	.00	.11	.08	.06	-.02	.06	-.19*	-.29**	-.22**

Note. HP: harmonious passion; OP: obsessive passion; CP: passion criteria; NE: need fulfillment; CA: parental care; AU: parental autonomy-support; OV: parental overprotection; T1: Time 1; T2: Time 2; T3: Time 3; T4: Time 4; M: mean; SD: standard deviation; α: Cronbach's alpha; *p<.05; **p<.01.

Figure S1

Schematic illustration of autoregressive and latent growth models
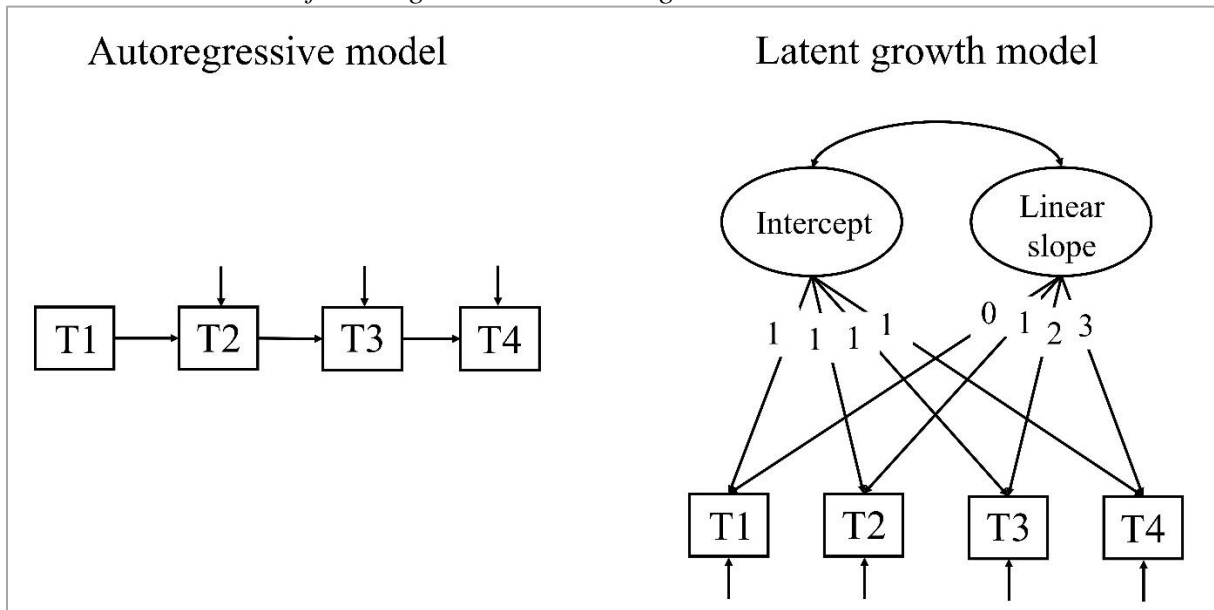
Note. T1: Time 1 scores; T2: Time 2 scores; T3: Time 3 scores; T4: Time 4 scores.

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