Are You "In the Zone" Or "Disconnected"? Flow, Dissociative Absorption, and Their Adaptive and Maladaptive Correlates[1,2]

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Abstract: *Objective*: The terms dissociative absorption and flow describe tendencies to experience immersive consciousness states, yet dissociation is sometimes considered maladaptive whereas flow is typically considered to be adaptive. We explored their trait and state associations with psychopathology, game task performance, and mood, and examined the hypothesized moderation effect of self-efficacy. *Method*: In the present study, 303 undergraduates completed trait questionnaires and 63 high/low absorbers reported their state before and after an immersive task ("Tetris"). Task performance was also assessed. *Results*: We found that flow was distinguishable from dissociation but was inconsistent; two of its components ("transformation of time" (ToT) and "merging of action and awareness" (MoAA)) were positively associated with dissociation and psychopathology, and, unlike other flow components, were unrelated to enhanced task performance. Although the trait associations of ToT and MoAA with psychopathology were not dependent on self-efficacy levels, trait dissociation was more strongly related to psychopathology under low self-efficacy. In the state phase, state immersion (both ToT and dissociative absorption) was associated with mood improvement, especially under low self-efficacy. *Conclusion*: Our results prompt us to question the validity of flow as a cohesive construct, as measured by the Dispositional Flow Scale-2. Immersive experiences, including ToT and dissociative absorption, led to short-term mood improvement in the state phase but, considering their trait associations with psychopathology, engaging in them excessively may be maladaptive in the long term.

Keywords: dissociation, absorption, flow, self-efficacy, immersion, psychopathology, well-being.

Highlights

- Flow as a dispositional concept may lack a cohesive structure
- Momentary immersion in a game is associated with mood improvement
- A trait tendency for dissociative absorption is associated with psychopathology
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This study explores individual differences in the inclination to enter immersive consciousness states from two vantage points: dissociation and flow. These two separate fields of research have treated the tendency for immersion as either

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mostly maladaptive or adaptive, which raises a question regarding the adaptivity of immersion and the conditions under which it may exert negative or positive effects. We will describe the two constructs and then hypothesize about their relation.

Dissociation, a disruption in the normal integration of consciousness, including processes such as memory, emotion, and behavior (DSM-5; American Psychiatric Association, 2013), is related to various psychopathological symptoms (e.g., Boysan et al., 2009; Ford & Gómez, 2015; Soffer-Dudek, 2014). According to trauma theorists, it is a coping mechanism generated by traumatic stress, and over time, it may become maladaptive, emerging even when the individual is confronted with minor stressors and increasing the risk for psychopathology (e.g., Briere et al., 2005; Dalenberg et al., 2012). It has also been suggested that mild-to-moderate dissociation may result from mild-to-moderate distress, regardless of whether it was trauma-related (Buchnik-Daniely et al., 2021). Some argue that dissociative experiences lie on a continuum ranging from "non-pathological" to "pathological" dissociation (Dalenberg & Paulson, 2009; Kihlstrom, 2005). Both extremes are represented in the most widely used measure in dissociation research, the Dissociative Experiences Scale (DES; Carlson & Putnam, 1993), which comprises the domains of dissociative amnesia, depersonalization/ derealization, and dissociative "absorption and imaginative involvement" (henceforth, DA). Aligning with the widespread notion of common (or "non-pathological") dissociation (Butler, 2006; Dalenberg & Paulson, 2009; Waller et al., 1996), DA is described as a narrowing of the attentional spotlight resulting in full engagement with the attentional object and obliviousness to the surroundings (Soffer-Dudek et al., 2015; Waller et al., 1996). DA should not be confused with the general concept of absorption, which refers to an intense cognitive involvement in one or more aspects of conscious awareness (Tellegen & Atkinson, 1974). DA is similar but pertains only to narrowing rather than expansion of consciousness and is more strongly associated with other dissociative measures than with Tellegen's absorption (Bregman-Hai et al., 2020). Some structural dissociation theorists (Van der Hart et al., 2004), claim that DA is not dissociation, but see Soffer-Dudek & Somer (2023) for an account of the inherent dissociative elements of DA.

Although most dissociation theorists and researchers intuitively refer to DA as "non-pathological dissociation", there is little empirical evidence to demonstrate its adaptive functions. On the contrary, high DA is associated with various psychopathological symptoms such as obsessive-compulsive symptoms (Soffer-Dudek, 2017, 2019; Soffer-Dudek et al., 2015) and psychotic-like experiences (Humpston et al., 2016). In fact, DA and the DES Taxon—a subscale considered to reflect pathological dissociation that mostly excludes DA items—are significantly associated with each other (Allen et al., 2002) and with psychopathology (Levin & Spei, 2004). Moreover, intense immersive imaginative involvement in daydreaming may indicate a psychological syndrome termed "maladaptive daydreaming," in which the absorptive experience is addictive, resulting in dysfunction and distress (Somer et al., 2017). Due to DA's robust linear links with other dissociative subscales and with psychopathology, we have claimed that the label "non-pathological dissociation" should perhaps be abandoned in favor of a more neutral "common dissociation" (Soffer-Dudek, 2017; Soffer-Dudek et al., 2015).

A recent empirical study, however, suggested that despite its linear associations with trait psychopathology, DA may also carry some benefits or be adaptive, as suggested by some scholars (e.g., Butler, 2004; Cardeña, 1997). Specifically, among highly-functioning young adults, high absorbers were characterized by certain cognitive disadvantages, such as slower response times and increased commission errors, but compared to low absorbers, they had superior visual imagination abilities (Bregman-Hai et al.,

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2018). Butler (2006) theorized that adaptive absorptive processes may play a role in everyday activities, such as sports or listening to music and linked this kind of DA to the concept of "flow," a consciousness state that may occur during total immersion in activities, and in which there is a balance between one's skills and the activity's difficulty (Nakamura & Csikszentmihalyi, 2014). Such an experience is also referred to as an "autotelic experience," an enjoyable activity that is undertaken for its own sake, with no expectation of reward (Csikszentmihalyi et al., 2014). Flow is associated with a variety of positive factors, including psychological well-being (Sahoo, 2015), life satisfaction, self-esteem, decreased anxiety (Asakawa, 2010), and improved performance (Engeser & Rheinberg, 2008; Whitson & Consoli, 2009).

Among dancers, dissociation and flow were found to be separate processes (Thomson & Jaque, 2012), and in a later study on performing artists, only absorption and creative experiences, but not flow, were heightened among those with a history of multiple childhood adversities (Thomson & Jaque, 2018). Flow and DA have been conceptualized as "integrating" versus "separating", respectively (Thomson & Jaque, 2012). On the other hand, Carleton, Abrams, and Asmundson (2010) argued that absorption is a unifying or aggregative shift in awareness. Moreover, flow and DA seem to share similar attributes, and both were found to lead to greater task immersion (see Nakamura & Csikszentmihalyi, 2014 for flow, and Jennett et al., 2008 for DA). In fact, the components of flow – transformation of time (ToT) and merging of action and awareness (MoAA), which seem to imply dissociation, were indeed positively linked to dissociation among gamblers and athletes (Wanner et al., 2006).

In a recent study on performing artists, depersonalization was inversely associated with the flow components of sense of control, loss of self-consciousness, and autotelic experience, but positively associated with ToT (Importantly, the abstract of that paper states that the direction of the association with ToT was like the other scales, but that is not in accordance with the relevant data in the table within the paper. We verified with the authors that the mistake is in the abstract and not in the table). Moreover, performing artists with depersonalization disorder were significantly lower on the flow subscales of sense of control and autotelic experience (Thomson & Jaque, 2021). Therefore, we will refer to the flow components of ToT and MoAA as the "dissociative" components and to its other components as the "non-dissociative" components. Notably, the flow component label "loss of self-consciousness" seems to imply detachment from one's surroundings and thus may also purportedly suggest dissociative properties. Its items, however, assess disregard for evaluation from others, that is, the extent to which individuals do not worry about others' opinions of them, which is not essentially dissociative. Indeed, Wanner et al. (2006) found that high dissociators had higher, rather than lower, concern of evaluation. The treatment of dissociative and non-dissociative components by Thomson & Jaque (2012) as a single, cohesive scale may be the reason that they did not find a relation between flow and DA in dancers (Thomson & Jaque, 2012). The resemblance between dissociation and some aspects of flow raises the question of why the former is related to psychopathology and the latter to enhanced mental health? Butler (2004) suggested the pertinence of self-efficacy (SE) to distinguish flow from other dissociative experiences; however, to the best of our knowledge, this theoretical assertion has not been empirically explored.

SE refers to an individual's personal belief in their ability to achieve goals (Bandura, 1977), and it is positively associated with flow (Mesurado et al., 2016; Salanova et al., 2006). As for dissociative symptoms, SE is a protective factor in the context of post-traumatic stress disorder (PTSD), and it facilitates recovery from traumatic experiences (Benight et

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al., 2001; Benight & Harper, 2002), probably because of the sense of control over one's distress instilled by SE (Benight & Bandura, 2004). SE may therefore moderate the relation of immersion (flow or DA) with adaptive versus maladaptive correlates.

Some researchers have suggested that flow and immersion should be better differentiated (Michailidis et al., 2018). The present study examined the similarities and distinctions between the two immersive tendencies, DA and flow, their relation to psychopathology and objective functioning, and the possible moderating role of SE. We evaluated both dispositional and situational flow and DA, by conducting two different study phases: trait (correlational) and state (induced immersion). The induced immersive state was created by using the "Tetris" computer game, a validated method to experimentally induce flow (Keller & Bless, 2008).

The study hypotheses were: (a) Trait DA will be associated with the "dissociative" flow components (ToT and MoAA), and an exploratory factor analysis may yield a combined factor; (b) Dissociation will be positively related to trait psychopathology, whereas non-dissociative flow components will show inverse relations; (c) In the state phase, non-dissociative flow components will be positively related to performance in the immersive task and to positive mood change following the task; (d) In both phases, SE will moderate the relations between immersion (DA and the dissociative flow components), on the one hand, and psychopathological symptoms, task performance, and change in mood, on the other.

Materials and Methods

Participants and Procedure

For Phase 1 of the study, 314 undergraduate students enrolled in the study "Dissociation, attention, risk, and resilience," completing questionnaires that contained items for trait flow, dissociation, and SE. We (the first two authors, under the supervision of the third author) presented the study to participants online through the university's experiment system by stating that they were asked to complete a series of self-report questionnaires taking about 50 minutes. At the recruitment stage we explained that the study explored the links between dissociation, personality, and various attention and emotional states, that there were no right or wrong answers, and that participation in the study would contribute to the knowledge about dissociation and altered consciousness states. Additional measures administered are beyond the scope of the present investigation and are described elsewhere (Soffer-Dudek, 2019). The order of the questionnaires was counterbalanced. Eleven participants were excluded from the final sample because of either substantial missing data (7 participants) or very short completion time (less than 15 minutes in total for all questionnaires; 4 participants). Thus, the final sample comprised 303 participants (225 women, 78 men; aged 18–28, M = 23.53, SD = 1.39). Of the full sample, 215 participated in exchange for course credit and 88 for monetary reimbursement of 50 NIS (~$14). Independent samples t-tests indicated no significant differences between them on any of the study variables. We determined our sample size according to the guideline suggesting that N = 300 is a good sample size for factor analysis (Comrey & Lee, 1992).

For Phase 2 of the study, about 5-6 months on average after Phase 1, 155 participants with the highest and lowest scores on DA were offered to participate in a follow-up study, in exchange for a small sum (the equivalent of about $16). Sixty-four of them con-

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sented, whereupon they underwent a session of computerized tasks, and were administered state questionnaires before and after the tasks (T1 and T2). The first two authors presented the study as an experiment that would last an hour and a half and that would involve the completion of a few tasks and questionnaires. Again, we explained that the purpose of the study was to learn more about dissociation and altered consciousness states. One participant was excluded from the final sample due to a technical malfunction during the experiment. Thus, the final sample comprised 63 participants (52 women, 11 men; aged 20–27, *M* = 23.52, SD = 1.35). Of the full *N* = 63 sample, 33 participants were high in DA (*M* = 52.09, *SD* = 13.61, range 31.11-77.78), and 30 were low (*M* = 4.52, *SD* = 2.84, range 0-8.89). Our sample size of 63 participants is similar to the sizes used in previous studies in the field of task functioning in non-clinical dissociators (Chiu et al., 2009; Giesbrecht et al., 2007). Also, we relied on the work of Weibel & Wissmath (2011), who investigated the relation between flow and performance in various computer games, to calculate power. In the context of a non-realistic game with minimalistic design, the correlation between flow and performance in that study was *r* = .35. The sample size needed for this effect size according to G*Power software (Faul et al., 2009) is 61. We therefore deemed our sample of 63 participants suitable. We also referred to this sample and the participants' functioning on the task that we describe below in a different publication that explored sense of agency, automaticity, and meta-cognition for recall of task details (Bregman-Hai et al., 2020). The information presented in that paper differs markedly from that in the current paper, that study does not include flow, SE, or mood change.

Participants played "Tetris," a computer game (Meta-T; Lindstedt & Gray, 2015) that involves manipulating and rotating geometric objects that descend from the top of the screen with the objective of quickly stacking (fitting) these objects together to create complete rows of shapes, which then disappear, earning the player points (uncompleted rows fill the playing field, i.e., screen; the player must stack the shapes fast enough to complete rows before the shapes fill the screen in uncompleted rows). To induce a state of immersion (DA/ flow), the falling speed of the objects was individually adapted to engender concordance between the participant's skills and the task demands. Participants played for 10 minutes and were asked to start a new game if they were disqualified before the time elapsed (i.e., the player could not stack shapes fast enough to prevent the uncompleted rows from filling the screen entirely, leaving no room to stack new shapes, meaning that the game was over). Task performance was assessed based on the maximum number of lines that participants managed to clear in one game. The Ben-Gurion University of the Negev institutional ethics review board approved both study phases, carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki). Participants signed informed consent at the beginning of the studies and were debriefed with more detailed explanations of the purpose of the study following their participation.

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Measures

Dissociative Experiences

In Phase 1, dissociation was assessed using the revised Dissociative Experience Scale (DES-II; Carlson & Putnam, 1993), in which respondents estimate the percentage of time during the day that they experience any of 28 dissociative phenomena on an 11-point scale (0%, 10%, 20%, etc.). Cronbach's alphas in the present study were .89 for DA, .87 for dissociative amnesia, and .85 for depersonalization/derealization, and for the total score, it was .94. The Hebrew version of the DES has good psychometric properties (Somer et al., 2001). In Phase 2, we administered a state DA scale, adapted to this study from trait DA (items 2, 15, 17, 18, 20, 21, 22, 23, and 24 from the DES). It assessed the extent of partici-

pant absorption in the Tetris game (e.g., "I was not sure whether I had done the task or just dreamed about it") on an 11-point scale (0%-100%). Cronbach's alpha for these nine items was .63. We decided to omit the first item, which was based on item # 2 of the DES, "I did not hear background noise or talk around me,"}, since the game had background music. Cronbach's alpha for the final 8-item scale was .65. The correlation between trait and state DA was r = .53, p<.001.

Flow

In Phase 1, flow was assessed using the Dispositional Flow Scale-2 (DFS-2; Jackson & Eklund, 2002), a 36-item self-report inventory with a scale from 1 (never) to 5 (always). Nine dimensions of flow are assessed: challenge-skills balance, clear goals, unambiguous feedback, total concentration on the task at hand, sense of control, loss of self-consciousness, MoAA, ToT, and autotelic experience. Cronbach's alphas in this study were .75, .82, .89, .88, .80, .93, .69, .85, and .86, respectively, and .92 for the total DFS score. In Phase 2, flow was assessed using the Flow State Scale (FSS; Jackson & Marsh, 1996), a 36-item scale assessing the same nine dimensions, but in the context of a specific activity. Unfortunately, the last item of the FSS, namely, "I found the experience extremely rewarding," was accidentally omitted from the computerized questionnaire. Thus, the "autotelic experience" subscale in this study was based on just 3 items instead of 4. Cronbach's alphas were .68, .74, .84, .87, .90, .82, .84, .84, and .90 for the subscales, respectively, and .87 for the total FSS score. Proficient English speakers translated and back-translated both flow questionnaires to obtain validated Hebrew versions for this study. The correlation between the DFS and the FSS was r = .31, p = .015.

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Self-Efficacy (SE)

In Phase 1, we assessed SE using the 9-item perceived SE subscale of the Self-Control Schedule (SCS; Rosenbaum, 1980), originally a 36-item self-report measure, designed to assess learned resourcefulness, on a scale ranging from -3 (very uncharacteristic of me) to 3 (very characteristic of me). Cronbach's alpha for the SE subscale in the present study was .66. For Phase 2, we created a state SE scale, initially based on 8 items from the SE subscale of the SCS, but adapted in content to assess SE during the task (e.g., "I could change my actions according to my will"). Respondents indicated the degree to which each statement characterized their experience during the Tetris task on a scale ranging from -3 (not at all) to 3 (very much). Cronbach's alpha for all 8 items was a low .56, so we decided to omit three weakly-correlated items, resulting in a Cronbach's alpha of .73 for a 5-item scale. The correlation between trait and state SE was r = .42, p = .001.

Psychopathological Symptoms and Mood

We evaluated psychopathological tendencies in Phase 1 using the Brief Symptom Inventory (BSI; Derogatis & Melisaratos, 1983), a 53-item self-report measure that assesses nine types of psychological symptoms – somatization, obsessive–compulsive symptoms, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism – on a 5-point Likert scale ranging from 0 (not at all) to 4 (extremely). The BSI is reliable in the Israeli population (Gilbar & Ben-Zur, 2002). Cronbach's alphas in this study were .80, .80, .80, .86, .81, .80, .67, .77, and .78 for the subscales, respectively, and .96 for the total BSI score. Mood was assessed in Phase 2, before (T1) and after (T2) the Tetris task, by using a state version of the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988) that is used to assess positive (10 items) and negative (10 items) affect in the current moment on a scale ranging from 1 (very slightly or not

at all) to 5 (extremely). For each of the subscales (positive and negative), we subtracted the score of T1 from that of T2 to create a variable that represents the changes in positive and negative moods. A higher score on the positive emotion change score indicated improvement in mood, whereas a higher score on the negative emotion change score indicated a deterioration in mood. The two difference scores were not significantly correlated (r = -.05, p = .72), suggesting that they should be treated as two separate outcome variables.

Data Analyses

In both phases of the study, the amounts of missing data were negligible, so we did not employ a data completion strategy. In Phase 1, to assess the differentiation of dissociation and flow, we conducted an exploratory factor analysis (EFA) conjointly on DES and DFS items. Because of the exploratory nature of this inquiry, we did not specify the number of factors in advance and instead relied only on the default specification of Eigenvalues larger than 1, using SPSS software, version 23. Although this method may result in over-factoring, we did not pursue this investigation to retain a small number of factors, but rather to test whether any combined DES-DFS factors would emerge, as per our first hypothesis (In the supplementary material file, however, we also report the scree plot, which enables Catell's scree test to be examined for a more conservative criterion). The factor scores that emerged following the "Eigenvalue > 1" criterion were saved and used in partial correlations to assess their inter-correlations and associations with psychopathological symptoms and SE while controlling for sex, because of the preponderance of women in the study. They were also used in linear regression analyses, in which we examined whether SE moderates the relations between each of the immersion factors (DA and dissociative flow factors), on the one hand, and psychopathological symptoms, on the other, again controlling for sex.

In Phase 2, we used independent-samples t-tests to assess whether high- versus low-trait DA groups would have significantly different scores on state DA, state flow, and state SE. Next, we examined the partial correlations between state immersion (DA and dissociative flow scales) on the one hand, and state SE, task performance and mood change, on the other, controlling for sex and trait DA group. Finally, we employed regression analyses in which we relied on state immersion to predict performance on, and mood change after, playing a game of Tetris. We examined whether state SE moderated these relations, controlling for sex.

Notably, as Phase 2 analyses were based on two groups that were collapsed into one group and a relatively small sample, we did not expect the immersion variables to distribute normally. We therefore used bootstrapping (based on 1000 re-samples and bias corrected and accelerated confidence intervals). Further details regarding the data analyses are presented in detail in the supplementary material.

Results

Phase 1 (means and standard deviations of study variables are included in the supplementary material).

Exploratory Factor Analysis (EFA) and Correlations Between Resultant Factors

The Kaiser-Meyer-Olkin (KMO) Test of Sampling Adequacy was high (KMO = .89) and the Bartlett test of sphericity was significant (χ^2 = 12,044, df = 2,016, p<.001), indicating the suitability of these data for factor analytic procedures. In an EFA of DES and DFS items,

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thirteen factors emerged, all with loadings above .25, suggesting a relatively clear pattern of results from an empirical perspective. However, the thirteenth factor consisted of only a single item (DFS item 3; "I clearly know what I want to do"), and therefore it was not included in later analyses. Of the 12 remaining factors, none included items from both questionnaires; instead, each was based either on the items of the DES or the DFS alone, attesting to a coherent result pattern for the EFA from a theoretical perspective and supporting the separateness of the scales. The four DES factors were Depersonalization/Derealization, Dissociative Amnesia, Absorption and Obliviousness (DA-OBLIV), and Dissociative Identity Tendency (DA-DID). The latter two contain items that traditionally belong to the DA subscale of the DES, and thus, we will focus on them in our analyses as representative of a tendency for immersion. The eight DFS factors were Challenging and Rewarding Experience, Loss of Self-Consciousness, ToT, Enhanced Concentration, Unambiguous Feedback, MoAA, Sense of Control, and Clear Goals. All factors and the complete results of the EFA, including a scree-plot and zero-order correlations between the factors, which were saved as variables using the regression method, can be found in the supplementary material. Catell's scree plot results were indecisive but tended to show that the first five factors explained most of the variance. Included among these factors were DES DA-OBLIV and four DFS factors, while the more "pathological" factors of the DES seemed to explain less variance in this non-clinical sample.

Table 1 presents, controlling for sex, the partial correlations between the factors that emerged in the EFA. In every analysis in which we calculated correlations (in this table and later in the manuscript), we interpreted the findings according to the guidelines suggested by Gignac & Szodorai (2016) for individual differences studies, which suggest more liberal criteria than those originally proposed by Cohen, according to which coefficient sizes of .10, .20, and .30 correspond to weak, medium, and strong associations,

Table 1

Partial Correlations (Controlling for Sex) Between EFA Factors

	1	2	3	4	5	6	7	8	9	10	11
2	.02 [-.10, .14]										
3	-.16** [-.27, -.04]	.19*** [.08, .30]									
4	.28*** [.17, .38]	.30*** [.19, .40]	.07 [-.05, .19]								
5	-.29*** [-.39,-.18]	.29*** [.18, .39]	.31*** [.20, .41]	-.13* [-.24, -.01]							
6	.43*** [.33, .52]	-.09 [-.20, .03]	-.07 [-.19, .05]	.21*** [.10, .32]	-.19*** [-.30, -.08]						
7	.58*** [.50, .65]	-.07 [-.19, .05]	-.07 [-.19, .05]	.24*** [.13, .35]	-.24*** [-.35, -.13]	.49*** [.40, .57]					

8	.00 [-.12, .12]	.40*** [.30, .49]	.15** [.03, .26]	-.06 [-.18, .06]	.41*** [.31, .50]	-.12* [-.23, .00]	-.08 [-.20, .04]				
9	.10 [-.02, .21]	.27*** [.16, .38]	.27*** [.16, .38]	.26*** [.15, .37]	.15** [.03, .26]	.16** [.04, .27]	.15* [.03, .26]	.15** [.03, .26]			
10	-.11 [-.21, .02]	.33*** [.22, .43]	.22*** [.11, .33]	-.05 [-.17, .07]	.39*** [.29, .48]	-.17** [-.28, -.06]	-.06 [-.18, .06]	.38*** [.28, .48]	.16** [.04, .27]		
11	.06 [-.06, .18]	.39*** [.29, .48]	.10 [-.02, .21]	-.05 [-.17, .07]	.41*** [.31, .50]	-.08 [-.20, .04]	-.01 [-.13, .11]	.56*** [.48, .64]	.15** [.03, .26]	.41*** [.31, .50]	
12	.54*** [.45, .62]	-.02 [-.14, .10]	-.06 [-.18, .06]	.29*** [.18, .39]	-.18** [-.29, -.07]	.38*** [.28, .48]	.35*** [.24, .45]	-.06 [-.18, .06]	.12* [.00, .23]	-.16** [-.27,-.04]	.05 [-.07, .17]

Note. 1= Absorption and Obliviousness (DA-OBLIV; DES), 2= Challenging and Rewarding Experience (DFS), 3= Loss of Self-Consciousness (DFS), 4= Transformation of Time (ToT; DFS), 5= Enhanced Concentration (DFS), 6= Depersonalization and Derealization (DES), 7= Dissociative Amnesia (DES), 8= Unambiguous Feedback (DFS), 9= Merging of Action and Awareness (MoAA; DFS), 10= Sense of Control (DFS), 11= Clear Goals (DFS), 12= Dissociative Identity Tendency (DA-DID; DES). DES = Revised Dissociative Experiences Scale. DFS = Dispositional Flow Scale. 2. In brackets are 95% confidence intervals, *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

respectively. As can be seen in the table, the four DES factors were all strongly and significantly correlated with each other (Pearson's *r*'s ranging from .35 to .58, p<.001), suggesting that they are separate, yet related, factors. In contrast, the eight DFS factors showed a range of correlations (weak to strong), some of which were not significant. Importantly, ToT was uncorrelated with four other DFS factors and was in fact significantly inversely associated with "Enhanced Concentration". Furthermore, ToT was positively correlated with all four DES factors (*r*s ranging from .21 to .29, all p<.001). Similarly, but via a weaker relation, MoAA positively correlated with three out of the four DES factors. ToT and MoAA were the only DFS factors that correlated significantly with DES factors.

Factor Correlations with Self-Efficacy and Psychopathological Symptoms

Table 2 presents the partial correlations, controlling for sex, for each of the twelve factors with SE and psychopathological symptoms. As shown in the table, all four DES factors were inversely correlated with SE (*r*s range from -.20 to -.26, *p*<.001) and were associated with psychopathological symptoms (for the general BSI score: r's ranged from .36 to .45, p<.001; for the specific symptom scales: *r*s ranged from .18, *p*<.01 to .45, *p*<.001). Conversely, six out of the eight DFS factors (specifically, all factors other than ToT and MoAA) were associated with SE (*r*s ranged from .20 to .33, *p*<.001) and inversely related to psychopathological symptoms (for the general BSI score: *r*s ranged from -.24 to -.41, *p*<.001; for specific symptom scales, a variety of correlations (weak to strong, most of them moderate) at varied levels of significance). Once again, the two factors ToT and MoAA exhibited different relations than those measured for the other DFS factors. Specifically, their patterns of associations with SE and psychopathological symptoms were more like those of the DES factors. ToT correlated negatively with SE (*r* = -.18 [-.29, -.07], *p*<.01), and positively with psychopathological symptoms (for the general BSI score: *r* = .21 [.10, .32], *p*<.001; for specific symptoms scales: moderate to low correlations at various degrees of significance). MoAA correlated weakly with several psychopathological symptom scales. Inso-

Table 2

Partial Correlations (Controlling for Sex) of the Twelve EFA Factors (Columns), with Self-Efficacy and Psychopathological Symptoms (Rows).

	SE	BSI	S	OC	IS	A	D	H	PA	PI	P
1	-.26***	.41***	.34***	.43***	.33***	.38***	.20***	.36***	.38***	.33***	.34***
	[-.37,-.15]	[.31,.50]	[.23,.44]	[.33,.52]	[.22,.43]	[.28,.48]	[.09,.31]	[.25,.46]	[.28,.48]	[.22 .43]	[.23,.44]
2	.24***	-.24***	-.12*	-.22***	-.16**	-.23***	-.29***	-.26***	-.19***	-.07	-.17**
	[.13,.35]	[-.35,-.13]	[-.23,.00]	[-.33,-.11]	[-.27,-.04]	[-.34,-.12]	[-.39,-.18]	[-.37,-.15]	[-.30,-.08]	[-.19,.05]	[-.28,-.06]
3	.30***	-.28***	-.15*	-.26***	-.35***	-.26***	-.21***	-.18**	-.21***	-.24***	-.26***
	[.19,.40]	[-.38,-.17]	[-.26,-.03]	[-.37,-.15]	[-.45,-.24]	[-.37,-.15]	[-.32,-.10]	[-.29,-.07]	[-.32,-.10]	[-.35,-.13]	[-.37,-.15]
4	-.18**	.21***	.23***	.22***	.16**	.21***	.12*	.06	.22***	.10	.20***
	[-.29,-.07]	[.10,.32]	[.12,.34]	[.11,.33]	[.04,.27]	[.10,.32]	[.00,.23]	[-.06,.18]	[.11,.33]	[-.02,.21]	[.09,.31]
5	.30***	-.41***	-.30***	-.54***	-.31***	-.37***	-.30***	-.30***	-.30***	-.30***	-.28***
	[.19,.40]	[-.50,-.31]	[-.40,-.19]	[-.62,-.45]	[-.41,-.20]	[-.47,-.27]	[-.40,-.19]	[-.40,-.19]	[-.40,-.19]	[-.40,-.19]	[-.38,-.17]
6	-.22***	.42***	.37***	.31***	.27***	.39***	.29***	.26***	.45***	.32***	.44***
	[-.33,-.11]	[.32,.51]	[.27,.47]	[.20,.41]	[.16,.38]	[.29,.48]	[.18,.39]	[.15,.37]	[.35,.54]	[.21,.42]	[.34,.53]
7	-.20***	.36***	.40***	.33***	.25***	.31***	.18**	.29***	.35***	.30***	.28***
	[-.31,-.09]	[.25,.46]	[.30,.49]	[.22,.43]	[.14,.36]	[.20,.41]	[.07,.29]	[.18,.39]	[.24,.45]	[.19,.40]	[.17,.38]
8	.22***	-.24***	-.18**	-.28***	-.17**	-.21***	-.24***	-.15*	-.15**	-.15*	-.18**
	[.11,.33]	[-.35,-.13]	[-.29,-.07]	[-.38,-.17]	[-.28,-.06]	[-.32,-.10]	[-.35,-.13]	[-.26,-.03]	[-.26,-.03]	[-.26,-.03]	[-.29,-.07]
9	.00	.11	.16**	.00	.05	.08	.12*	.07	.15*	.08	.16**
	[-.12,.12]	[-.01,.22]	[.04,.27]	[-.12,.12]	[-.07,.17]	[-.04,.20]	[.00,.23]	[-.05,.19]	[.03,.26]	[-.04,.20]	[.04,.27]
10	.33***	-.40***	-.25***	-.35***	-.31***	-.36***	-.37***	-.33***	-.32***	-.33***	-.34***
	[.22,.43]	[-.49,-.30]	[-.36,-.14]	[-.45,-.24]	[-.41,-.20]	[-.46,-.26]	[-.47,-.27]	[-.43,-.22]	[-.42,-.21]	[-.43,-.22]	[-.44,-.23]
11	.20***	-.24***	-.16**	-.29***	-.16**	-.21***	-.27***	-.14*	-.19***	-.11	-.17**
	[.09,.31]	[-.35,-.13]	[-.27,-.04]	[-.39,-.18]	[-.27,-.04]	[-.32,-.10]	[-.38,-.16]	[-.25,-.02]	[-.30,-.08]	[-.22,-.01]	[-.28,-.06]

far as our results at this point in the study suggested that ToT and MoAA indeed represent dissociative flow scales, in subsequent immersion variable analyses we used the two DA-related DES factors and the two dissociative flow scales ToT and MoAA.

Moderation Analyses of Trait Measures

Next, we explored whether SE may moderate the relationships between immersion (DA or dissociative flow components) and psychopathology. We began the analyses with the DA-related dissociation factors (DA-OBLIV and DA-DID), which we used in two regression analyses that we ran to predict psychopathological symptoms. Each model also included SE and its interaction with the DA-related factor. In addition to the statistically significant positive main effects, statistically significant interactions emerged between each of the DA factors with SE (B = -0.01 [-0.014, -0.004], se = 0.00, t = -3.33, β = -.16, p = .001 for DA-OBLIV; B = -0.01 [-0.014, -0.002], se = 0.01, t = -2.59, β = -.12, p = .01 for DA-DID). Probes for the first statistically significant interaction, when treating DA-OBLIV as the focal predictor and SE as the moderator, revealed that, as hypothesized, DA-OBLIV positively predicted psychopathological symptoms only when SE was low (B = 0.22 [0.153, 0.277], se = 0.03, t = 6.85, β =.37, p <.001), but not when it was high (B = 0.07 [-0.016, 0.149], se = 0.04, t = 1.58, β =.11, p = .115). A slightly different pattern emerged for the interaction wherein DA-DID was the focal predictor. Probes revealed that DA-DID strongly and positively predicted psychopathological symptoms not only when SE was low (B = 0.25 [0.182, 0.323], se = 0.04, t = 7.04, β = .42, p <.001), but also when it was high, albeit less strongly (B = 0.12 [0.046, 0.202], se = 0.04, t = 3.12, β = .21, p = .002).

We conducted two similar regression models with the dissociative flow components (ToT and MoAA) as the focal predictors. In these analyses, there were only main effects (suggesting that higher dissociative flow components, and lower SE, are associated with

higher psychopathology), whereas the interaction terms were non-significant (*B* = -0.01 [-0.012, 0.001], *se* = 0.01, *t* = -1.55, β = -.08, *p* = .122, for ToT; B=-0.01 [-0.015, 0.000], *se* = 0.01, *t* = -1.85 β = -.09, *p* = .065, for MoAA), which does not support the moderation hypothesis vis-à-vis flow.

Phase 2

T-Tests for Group Comparisons

Independent samples *t*-tests to compare the high and low trait DA groups on trait flow and SE and on state DA, flow, and SE confirmed that these groups were indeed distinct. Additional information is detailed in the supplementary material.

Table 3 presents bootstrapped partial correlations (controlling for sex and group) between the state flow subscales and state DA. As can be seen in the table, DA correlated with MoAA (*r* = .37 [.09, .64]) and with ToT (*r* = .47 [.25, .65]). In addition, DA correlated with autotelic experience (*r* = .26 [.05, .45]). Correlations among the FSS subscales suggest that ToT correlated significantly with MoAA and with some of the non-dissociative subscales of flow (challenge and skill balance, clear goals, and autotelic experience). In contrast, MoAA was uncorrelated with six FSS subscales and inversely associated with the sense of control subscale of the FSS.

Correlations of State Immersion (Flow, DA) with State Sense of Self-Efficacy, Performance on Tetris, and Mood Change

Table 4 presents bootstrapped partial correlations (controlling for sex and group) among state flow and DA, on the one hand, and state SE, performance on the Tetris task, and positive and negative mood change, on the other. Of note are the associations be-

Table 3
Correlations (Controlling for Sex and Group) Between State Flow Subscales and State Absorption

	1	2	3	4	5	6	7	8	9
2	.07 [-.18, .31]								
3	*.47 [.24, .65]*	.05 [-.19, .29]							
4	*.46 [.23, .66]*	-.02 [-.27, .25]	*.79 [.67, .89]*						
5	*.57 [.32, .74]*	-.04 [-.27, .20]	*.53 [.34, .69]*	*.61 [.42, .74]*					
6	*.45 [.18, .67]*	*-.31 [-.56, -.05]*	*.55 [.30, .73]*	*.64 [.45, .79]*	*.71 [.53, .84]*				
7	.05 [-23, .34]	.03 [-.27, .34]	-.16 [-.37, .08]	.00 [-.23, .24]	.06 [-.13, .27]	.20 [-.02, 43]			
8	*.34 [.12, .51]*	*.27 [.02, .50]*	*.26 [.04, .48]*	.12 [-.12, .35]	.13 [-.13, .39]	.14 [-.10, .36]	-.16 [-.40, .11]		

9	*.49* *[.18, .73]*	.06 [-.17, .28]	*.33* *[.07, .60]*	*.40* *[.17, .65]*	*.48* *[.17, .74]*	*.46* *[.24, .68]*	-.04 [-.26, .23]	*.51* *[.33, .65]*	
10	.11 [-.15, .41]	*.37* *[.09, .64]*	.06 [-.16, .28]	-.07 [-.31, .19]	.01 [-.27, .29]	-.04 [-.31, .24]	-.27 [-.50, .03]	*.47* *[.25, .65]*	*.26* *[.05, .45]*

Note. Correlation coefficients for which the bootstrapped confidence interval excludes zero are italicized. 1= Challenge and Skill Balance, 2= Merging of Action and Awareness (MoAA), 3= Clear Goals, 4= Unambiguous Feedback, 5= Concentration on Task, 6= Sense of Control, 7= Loss of Self Consciousness, 8= Transformation of Time (ToT), 9= Autotelic Experience, 10= State DA. In brackets are 95% bootstrapped bias-corrected and accelerated confidence intervals.

Table 4

Correlations (Controlling for Sex and Group) Between State Flow Subscales and State Absorption, State Sense of Control, Maximum Lines Cleared in Tetris, and Changes in Mood

	State self-efficacy	Maximum lines cleared in Tetris	Positive mood change	Negative mood change
Challenge and Skill Balance	.47 [.23, .69]	.23 [-.03, .48]	.33 [.06, .53]	.13 [-.22, .41]
Merging of Action and Awareness (MoAA)	-.30 [-.57, .01]	.10 [-.18, .39]	.08 [-.18, .31]	-.06 [-.36, .21]
Clear Goals	.36 [-.02, .65]	.39 [.11, .62]	.09 [-.18, .31]	-.09 [-.36, .17]
Unambiguous Feedback	.48 [.17, .70]	.47 [.24, .66]	.15 [-.11, .38]	-.08 [-.35, .18]
Concentration on Task	.45 [.17, .69]	.34 [.14, .52]	.27 [-.03, .49]	-.10 [-.42, .20]
Sense of Control	.59 [.31, .80]	.19 [-.10, .44]	.11 [-.17, .36]	.08 [-.19, .33]
Loss of Self Consciousness	.23 [-.05, .50]	-.03 [-.26, .22]	-.24 [-.46, -.01]	.23 [-.01, .48]
Transformation of Time (ToT)	-.10 [-.34, .15]	.14 [-.14, .41]	.39 [.18, .57]	-.31 [-.48, -.12]
Autotelic Experience	.26 [-.03, .55]	.36 [.13, .54]	.48 [.24, .67]	-.05 [-.31, .20]
State DA	-.34 [-.49, -.06]	.00 [-.24, .26]	.27 [-.02, .48]	-.25 [-.57, .14]

Note. Correlation coefficients for which the bootstrapped confidence interval excludes zero are italicized. DA = Dissociative absorption. In brackets are 95% bootstrapped bias-corrected and accelerated confidence intervals.

tween the non-dissociative flow subscales and the outcome variables. Specifically, four of the flow factors (challenge and skill balance, unambiguous feedback, concentration on task, and sense of control) correlated with state SE in the Tetris task (rs ranged from .45 to .59), and four correlated with the maximum number of lines cleared in Tetris (specifically, clear goals, unambiguous feedback, concentration on task, and autotelic experience; rs range from .34 to .47). In addition, three of the non-dissociative flow subscales were associated with change in positive mood, but in different directions. Challenge and skill balance (r = .33 [.06, .53]) and autotelic experience (r = .48 [.24, .67]) correlated with change in positive mood, suggesting an enhancement of positive emotions. In contrast, loss of self-consciousness correlated negatively with change in positive mood, suggesting a decrease in positive emotions (r = -.24 [-.46, -.01]).

As for the two dissociative state flow subscales, MoAA was uncorrelated with any of the outcome variables (state SE, performance, and change in mood), and ToT was uncorrelated with state SE and performance. However, ToT was associated with change in positive mood (r = .39 [.18, .57]), and was the only variable that was inversely associated with change in negative mood (r = -.31 [-.48, -.12]), again suggesting mood improvement following the task. State DA was inversely associated with state SE (r = -.34 [-.56, -.10]), but was uncorrelated with performance or with change in mood.

Moderation Analyses Involving State Measures, Performance in Tetris, and Mood Change

We conducted bootstrapped regression analyses to explore the possible moderating role of state SE in the relations between state immersion (DA, ToT, MoAA) during the Tetris task, and the three outcome variables: task performance (maximum lines cleared), and positive and negative change in mood, controlling for sex.

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In three regression analyses that predicted objective task performance, with either state DA, state MoAA, or state ToT as predictors, the main effects were non-significant, as were the interaction terms (B = -0.08 [-0.251, 0.041], se = 0.08, β = -.19, for DA; B = -1.04 [-2.681, 1.549], se = 1.10, β = -.22, for MoAA; B = -0.80 [-2.492, 1.021], se = 0.94, β = -.15, for ToT), lending no support to the moderation hypothesis.

A regression model predicting change in negative mood showed an inverse main effect for ToT (B = -1.29 [-2.385, -0.341], se = 0.49, β = -.33), suggesting that those who experienced ToT experienced a decrease in negative emotions following the task, and a positive main effect for sex (B = 2.46 [0.290, 4.795], se = 1.14, β = .21), suggesting that men experienced an increase in negative emotions following the task. The interaction term was non-significant (B = 0.18 [-0.328, 0.703], se = 0.24, β = .16). In a regression model for the same predicted variable with MoAA as the predictor, only a positive main effect for state SE was found (B = 0.44 [0.008, 0.921], se = 0.24, β = .34), suggesting that those who felt more sense of SE during the task experienced an increase in negative emotions following the task. Again, the interaction term was non-significant (B = -0.01 [-0.829, 0.345], se = 0.36, β = -.01). As for state DA, the main effects and the interaction term were non-significant (B = 0.03 [-0.018, 0.057], se = 0.02, β = .31, for the interaction effect).

In regression models that predicted change in positive mood, MoAA did not have a significant main effect or interaction, but there was a negative main effect for sex (B = -5.02 [-9.110, -1.105], se = 2.01, β = -.27), suggesting again that men experienced a decrease in positive emotions following the task. In a similar model with ToT as the predictor, however, there was a significant positive main effect for ToT (B = 2.50 [0.976, 3.984], se = 0.79, β = .40) and a significant interaction term (B = -0.74 [-1.191, -0.196], se = 0.27, β = -.41). Probes for the interaction revealed that ToT predicted positive mood change only when

SE during the game was low (*B* = 5.41, [2.681, 7.412], *se* = 0.93, β = .87) but not when it was high (*B* = 0.20 [-1.738, 1.781], *se* = 1.46, β = .03). As for state DA, the main effect was significant (*B* = 0.22 [0.046, 0.363], *se* = 0.09, β = .32), suggesting that those with DA experienced an increase in positive emotions following the task. There was also a significant negative main effect for sex (*B* = -5.78 [-9.549, -1.813], *se* = 1.86, β = -.31), suggesting that men experienced a decrease in positive emotions following the task. Again, the interaction term was significant (*B* = -0.06 [-0.104, -0.011], *se* = 0.02, β = -.37). Probes for the interaction revealed that state DA predicted positive mood change only when SE during the game was low (*B* = 0.35 [0.109, 0.552], *se* = 0.12, β = .51), not when it was high (*B* = -0.05 [-0.281, 0.131], *se* = 0.12, β = -.07).

Discussion

Whereas DA has at times been regarded as maladaptive given its construal as a dissociative factor and its associations with psychopathology, its counterpart "flow," which includes similar immersion attributes, has consistently been considered adaptive, as it is associated with enhanced performance (but see Partington et al., 2009; Schüler & Nakamura, 2013). Previous studies failed to discern these two similarly defined constructs as unequivocally separate, thus leaving open the question of whether dissociation can be adaptive. In line with the view that dissociation and flow are not one and the same (Thomson & Jaque, 2012), in the current study they emerged as separate constructs, as they did not have combined factors, even when considering all of the factors with an Eigenvalue larger than 1. This finding contrasted with our hypothesis, according to which some of the DA and flow items may load on a combined immersion factor.

Despite this finding, we question the validity of the DFS-2 and FSS measures of a unified "flow" construct. Whereas overall, "dissociation" was a cohesive construct, "flow" components were not all positively related with each other and they exhibited varied patterns of associations with other variables. This finding, in line with those of previous studies, suggests that the flow construct lacks cohesiveness (Jackson & Eklund, 2002; Marin & Bhattacharya, 2013). Moreover, the non-cohesiveness of flow (as measured in this study) seemed to suggest that the subscales for assessing dissociation (ToT and MoAA) are maladaptive, as they were unrelated to task performance and positively related to dissociation and psychopathology. This observation is in line with recent findings showing an inverse pattern of associations of depersonalization with the different flow aspects (ToT, on the one hand, compared to sense of control, loss of self-consciousness, and autotelic experience, on the other hand, also assessed with the DFS-2; Thomson & Jaque, 2021). As expected, the trait loss of self-consciousness did not correlate with DA, despite its dissociative-sounding label, as this trait's items assess social disregard for evaluation by others, i.e., a factor that pertains to social cognitions rather than to a true dissociative subscale. Thus, a more suitable label may be "low concern for external evaluation." However, the state (FSS) loss of self-consciousness scale includes one item that seems to evaluate loss of self-consciousness rather than social cognition ("I was not worried about my performance during the event") and indeed, the state scale showed a slightly different pattern of associations from non-dissociative flow subscales, but the differences between the situational and dispositional measures of flow should be further explored. In any case, our results suggest that the clearly dissociative trait (DFS-2) subscales of flow are ToT and MoAA, and that these subscales are not necessarily adaptive. The non-dissociative aspects of the DFS-2 may be those responsible for the hypothesized long-term positive effect of flow and the elicitation of better performance in activities when one enters a state of flow. Accordingly, several non-dissociative FSS flow scales were related to better Tetris performance in Phase 2 of this study. These findings lead us to a broader question of

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whether and, if so, how, the absorptive aspects of flow affect mood. Some evidence in this study suggests that immersive states may have a positive, short-term effect on mood. Specifically, ToT correlated with an increase in positive emotions following Tetris, and state DA showed the same correlation in the moderation analyses and a positive correlation with autotelic experience.

Importantly, SE was found to moderate the immersion-mood association to some extent. Although our results did not support Butler's (2004) suggestion that DA may be beneficial when experienced with high SE, high trait SE either nullified or ameliorated the association of trait DA with trait psychopathology. This finding may indicate that the relation of DA with psychopathology may be complex but not necessarily maladaptive. For example, dissociation is often considered to be a coping method, and those capable of controlling their common dissociative experiences may be able to leverage them to their benefit in challenging situations. In the state phase, an unexpected pattern emerged, whereby a positive change in mood among immersed participants was noted only under low SE. Interestingly, a worsening of mood following the task related to either being a male or having high SE. Possibly, those who felt a stronger need to achieve performance goals (i.e., were more worried about scoring points) were less able to allow themselves to enjoy the task, to become immersed in it, and to play it for intrinsic pleasure alone. In this sample, males may have been more competitive in the context of a computer game than females. In any case, immersion was related to a decrease in negative emotion (regardless of SE) and an increase in positive emotion (only among those with low SE). These results show that, under certain conditions, state immersion may be positive. Relatedly, individuals with low SE were better able to exploit interventions for relaxation and emotional writing (Kraft et al., 2008). To integrate our trait and state findings, this momentary improvement in mood following immersion (ToT, DA) – albeit positive or pleasant in a specific moment (during a computer game) – may be problematic or maladaptive when experienced chronically, as our data indeed demonstrated that trait immersion (ToT, MoAA, DA) was associated with increased psychopathology. Further research is needed to establish whether this is the case and why, and to determine the direction of causality for this long-term association (e.g., does immersion at the expense of attunement to the environment lead to psychopathology, or vice versa, or both). In any case, immersion seems to be a complex phenomenon in terms of adaptivity.

Several suggestions emerge from our findings: first, the assumed unity of flow, at least as measured by the DFS-2 and FSS, should be re-evaluated; it seems that when using these measures, dissociation-related flow factors do not necessarily represent the same psychological construct as non-dissociative flow aspects such as clear goals, especially not when assessed as traits (with the DFS-2). Second, the presumed adaptivity of "flow," as assessed with these measures, should also be questioned, as its nature was not found to be unequivocally positive. Third, the emergence of a different pattern for the moderating effect of SE in Phase 1 versus that obtained in Phase 2 left us with the question of what truly the nature of flow and dissociation is, and what (if it exists) is the variable responsible for their positive versus negative influences.

Returning to our initial question of whether mild dissociative experiences may be adaptive in the context of flow, the current study suggests that when they are assessed as traits with the DFS-2, the answer is negative: rather than exhibiting a positive effect the dissociative aspects of flow showed patterns similar to DA. Conversely, when assessed as states with the FSS, immersion appears to be associated with enhanced mood (but not better performance).

Notably, although we demonstrated associations between trait immersion and psychopathology, this study did not examine potential associations with positive factors

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(e.g., well-being, creativity, activity). In addition, the study has several other limitations. First, since it is a correlational study, causality between the variables cannot be deduced. Our use of two assessment points in the state phase, however, enabled us to examine the influence of the task. Second, insofar as the participants were students the findings do not necessarily represent the general population. However, we believe that students constitute a suitable group upon which to explore the topic of individual differences in immersion tendencies and SE, and our results are likely valid at least vis-à-vis young adults, who were a focus of interest in this case. Third, in Phase 2 we sampled the participants from the high and low ends of the continuum of DA scores, a sampling approach that may have led to an abnormal distribution of the data. This means that the results of Phase 2 may not be generalizable to other populations (e.g., those including the middle scores on DA). To that end, we conducted bootstrapped analyses that do not assume a normal distribution and we controlled for the group variable when we examined correlations with state DA. The limited variance, however, may have affected the results found, indicating that further research is needed to replicate and generalize these results. Finally, we assessed performance with a single, very specific measure (Tetris, lines cleared), but had we relied on several measures perhaps we would have been able to detect a positive effect for immersion. For example, tasks involving physical skills (e.g., dance) or creativity-related problem solving may produce different performance results than Tetris. It should be noted, however, that among performing artists, ToT was positively associated with depersonalization, unlike other facets of flow that were explored and found to be negatively related (specifically, sense of control, loss of self-consciousness, and autotelic experience; Thomson & Jaque, 2021), thereby supporting the overall pattern found in our study. Further research that leverages state measures and designs to study performing artists could shed more light on these processes.

In conclusion, our findings elucidate the notion of "non-pathological dissociation," immersion, or "flow" in the setting of a positive and enjoyable experience. At least in this investigation, DA and the dissociative domains of flow did not demonstrate an advantage in terms of an inverse relation with psychopathology or enhanced task performance. On the contrary, the tendency to become immersed (whether measured with a dissociation or a flow questionnaire) was associated with psychopathology. The previously reported positive effect of flow may have been the result of specific aspects of the concept unrelated to dissociation, but it is also possible that different flow measures can better capture positive dissociative flow. The results of this study nonetheless indicate that some of the dissociative domains of flow may effect short-term improvements in mood, especially among individuals with low SE. The contributions to the field made by our study notwithstanding, further research is needed to examine the notion of "non-pathological dissociation" in common, everyday situations to improve our understanding of the distinction between adaptive and potentially maladaptive experiences.

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Sind Sie "in der Zone" oder "abgetrennt"? Eine Untersuchung von Flow, dissoziativer Absorption und ihren angepassten versus fehlangepassten Korrelaten

Michal Zadik, Noa Bregman-Hai, und Nirit Soffer-Dudek

Zusammenfassung: Zielsetzung: Die Begriffe dissoziative Absorption und Flow beschreiben Tendenzen beim Erleben eindringlicher Bewusstseinszustände, wobei Dissoziation manchmal als fehlangepasst gilt, während Flow typischerweise als angepasst angesehen wird. Wir untersuchten ihre Trait- und Stateassoziationen mit Psychopathologie, Spielleistung und Stimmung und untersuchten den hypothetischen Moderationseffekt von Selbstwirksamkeit. Methode: In der vorliegenden Studie füllten 303 Studenten Traitfragebögen aus, und 63 Hoch-/Niedrig-Absorber berichteten über ihren Zustand vor und nach einer fesselnden Aufgabe ("Tetris"). Die Aufgabenleistung wurde ebenfalls bewertet. Ergebnisse: Wir fanden heraus, dass sich Flow von Dissoziation unterschied, aber inkonsistent war; zwei seiner Komponenten ("Transformation der Zeit" (TdZ) und "Verschmelzung von Handlung und Aufmerksamkeit" (VvHA)) waren positiv mit Dissoziation und Psychopathologie assoziiert und standen - im Gegensatz zu anderen Flow-Komponenten - in keinem Zusammenhang mit verbesserter Aufgabenleistung. Obwohl die Trait-Assoziationen von TdZ und VvHA mit Psychopathologie nicht vom Selbstwirksamkeitsniveau abhängig waren, war die Trait-Dissoziation bei geringer Selbstwirksamkeit stärker mit Psychopathologie verknüpft. In der State-Phase war die Zustandseindringlichkeit (sowohl TdZ als auch dissoziative Absorption) mit einer Stimmungsverbesserung verbunden, insbesondere bei geringer Selbstwirksamkeit. Schlussfolgerung: Unsere Ergebnisse veranlassen uns, die Gültigkeit von Flow als zusammenhängendes Konstrukt in Frage zu stellen, wie es mit der Dispositional Flow Scale-2 gemessen wird. Eindringliche Erfahrungen, einschließlich TdZ und dissoziativer Absorption, führten zu einer kurzfristigen Stimmungsverbesserung in der State-Phase, aber in Anbetracht ihrer Trait-Assoziationen mit Psychopathologie könnte ein übermäßiges Verweilen in diesen Bereichen auf lange Sicht fehlangepasst sein.

Eberhard Bauer

Você está "*In the Zone*" ou "Desconectado"? Uma Investigação sobre "*Flow*", Absorção Dissociativa, e seus Correlatos Adaptativos versus Correlatos Mal-adaptativos

Michal Zadik, Noa Bregman-Hai, e Nirit Soffer-Dudek

Resumo: Objetivo: Os termos absorção dissociativa e "*flow*" descrevem tendências a experimentar estados de consciência imersiva, embora a dissociação seja, por vezes, considerada mal-adaptativa enquanto que o "*flow*" é tipicamente considerado adaptativo. Exploramos suas características e estados associados com psicopatologias, performance em jogos e humor, e examinamos o efeito hipotético moderador da autoeficácia. Método: No presente estudo, 303 estudantes universitários completaram questionários sobre traços de personalidade e 63 deles, com alta ou baixa assimilação, relataram seu estado antes e depois de uma tarefa imersiva ("Tetris"). A performance em tarefas também foi avaliada. Resultados: Descobrimos que o "*flow*" distinguia-se da dissociação, mas era inconsistente; dois de seus componentes ("transformação da noção de tempo" (ToT, em inglês) e "fusão da ação e consciência" (MoAA, em inglês)) estavam positivamente associados à dissociação e psicopatologias e, ao contrário de outros componentes do "*flow*", não mostravam-se relacionados com o desempenho aprimorado de tarefas. Embora as associações de características dos componentes ToT e MoAA com psicopatologias não dependessem dos níveis de autoeficácia, características de dissociação estavam mais fortemente relacionadas a psicopatologias quando em contexto de baixa autoeficácia. O estado de imersão (tanto ToT como absorção dissociativa) demonstrou-se associado à melhora do humor, especialmente em contexto de baixa autoeficácia. Conclusão: Nossos resultados nos levam a questionar a validade do "*flow*" como uma construção coesa, conforme medido pela Dispositional Flow Scale-2. Experiências imersivas, incluindo ToT e absorção dissociativa, levaram a uma melhoria do humor a curto prazo, mas, considerando suas associações características com psicopatologias, envolver-se com elas excessivamente poderia ser mal-adaptativo a longo prazo.

Antônio Lima

¿Estás "en la Zona" o "Desconectado"? Flujo, Absorción Disociativa, y sus Correlatos Adaptativos y Desadaptativos

Michal Zadik, Noa Bregman-Hai, y Nirit Soffer-Dudek

Resumen: Objetivo: Los términos absorción disociativa y flujo (flow) describen la tendencia a experimentar estados de conciencia inmersiva, aunque a veces se considera a la disociación como desadaptativa, en tanto que se considera al flujo como típicamente adaptativo. Exploramos sus asociaciones de rasgo y estado con la

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psicopatología, el rendimiento en un juego y el estado de ánimo, y examinamos el efecto moderador hipotético de la autoeficacia. Método: En el presente estudio, 303 estudiantes universitarios completaron cuestionarios de rasgos y 63 altos/bajos en absorción informaron de su estado antes y después de una tarea de inmersión ("Tetris"). También se evaluó el desempeño en la tarea. Resultados: Encontramos que el flujo se distinguía de la disociación pero inconsistement; dos de sus componentes ("transformación del tiempo" (ToT) y "fusión de la acción y la consciencia" (MoAA)) estaban asociados positivamente con la disociación y la psicopatología, y, a diferencia de otros componentes del flujo, no se relacionaron con un mayor rendimiento en la tarea. Aunque las asociaciones de rasgo de ToT y MoAA con la psicopatología no dependieron de los niveles de autoeficacia, la disociación de rasgo se relacionó más fuertemente con la psicopatología bajo baja autoeficacia. En la fase de estado, la inmersión en el estado (tanto el ToT como la absorción disociativa) se asoció con la mejora del estado de ánimo, especialmente bajo baja autoeficacia. Conclusión: Nuestros resultados nos llevan a cuestionar la validez del flujo como un constructo cohesivo, medido según la Escala de Flujo Disposicional-2. Las experiencias inmersivas, incluyendo el ToT y la absorción disociativa, condujeron a una mejora del estado de ánimo a corto plazo en la fase de estado, pero, teniendo en cuenta sus asociaciones de rasgos con la psicopatología, participar en ellas excesivamente puede ser desadaptativo a largo plazo.

Etzel Cardeña

Supplementary Material

Data Analyses

In Phase 1, we conducted an exploratory factor analysis (EFA) with DES-II and DFS-2 items, used principal axis factoring (PAF) with oblique rotation (oblimin method, which allows for the factors to be inter-correlated), and interpreted the pattern atrix. In the linear regression analyses we conducted on Phase 1 data, each model relied on a DA-related factor which emerged in the EFA (whether stemming from the DES or the DFS), SE, controlling for gender, in the prediction of psychopathological symptoms. After exploring main effects, the interaction term between the first two predictors was added. The continuous predictor SE was centered beforehand (EFA factors had an average of zero, so there was no need for centering the DA-related variables). Gender was dummy coded as men = 1, and women = 0. For probing interactions, simple slope analyses were employed. Those high and low in SE (the moderator) were represented by one standard deviation above and below the mean, respectively (Aiken & West, 1991; Cohen et al., 2003). Two-tailed statistical significance tests were used, $p = .05$.

In Phase 2, due to the small sample size, we calculated partial correlations with the two groups collapsed into one, and the group variable controlled for, which enabled assessing the relationships of state immersion with other state variables, regardless of trait tendencies.

Results

Table S1 details mean and standard deviations of all trait variables in the study (dissociation, flow, self-efficacy, and psychopathology), along with their subscales.

EFA Factors

Due to lack of space, the table with the full results of the EFA is not included here but can be obtained from the authors. Specifically, Factor 1 consisted of seven DES items, mostly associated with the DA subscale; the items reflect the tendency to become absorbed in external or internal stimuli, resulting in obliviousness to the environment. Thus, it was labeled “Absorption and Obliviousness” (DA-OBLIV). Factor 2 included all four DFS items which assess autotelic experience and three DFS items that assess balance between the challenge of the action and one’s skills. Hence, it was labeled “Challenging and Rewarding Experience”. Factor 3 consisted of all four DFS items which assess the degree with which one is occupied by the evaluation of others, and therefore was labeled “Loss of Self Consciousness”, as the original name of the corresponding DFS scale. Factor 4 comprised all four DFS ToT subscale items, which relate to experiencing an alteration in the sense of time, hence, we kept the original label. Factor 5 included four DFS items which assess concentration on the task, and one DFS item which assesses control over one’s thought processes. It was labeled “Enhanced Concentration”. Factor 6 consisted of six DES items reflecting the tendency to experience detachment from one’s self or from reality,

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Table S1

Descriptive Statistics for Trait Variables (Phase 1)

	Mean	SD	Minimum	Maximum
DES total score	13.48	11.87	0.00	67.14
DES amnesia	7.49	10.84	0.00	58.75
DES dep-der	5.04	9.91	0.00	55.00
DES dissociative absorption (DA)	21.48	16.74	0.00	77.78
DFS-2 total score	3.30	0.47	1.63	4.94
DFS-2 Challenge skill	3.61	0.61	1.50	5.00
DFS-2 Merging action awareness	2.71	0.65	1.00	5.00
DFS-2 Clear goals	3.64	0.71	1.50	5.00
DFS-2 Feedback	3.63	0.75	1.50	5.00
DFS-2 Concentration	3.26	0.88	1.00	5.00
DFS-2 Sense of control	3.62	0.74	1.25	5.00
DFS-2 Loss of consciousness	2.78	0.92	1.00	5.00
DFS-2 Transformation of time	2.91	0.87	1.00	5.00
DFS-2 Autotelic experience	3.54	0.69	1.00	5.00
SCS Self efficacy subscale	5.98	8.24	-18.00	27.00
BSI total score	0.75	0.55	0.00	3.25
BSI Somatization	0.46	0.55	0.00	3.14
BSI obsessive-compulsive	1.12	0.77	0.00	3.67
BSI interpersonal sensitivity	0.95	0.83	0.00	4.00
BSI anxiety	1.01	0.69	0.00	4.00
BSI depression	0.98	0.75	0.00	3.50
BSI hostility	0.49	0.60	0.00	4.00
BSI phobic anxiety	0.51	0.54	0.00	3.20
BSI paranoid ideation	0.62	0.66	0.00	3.25
BSI psychoticism	0.65	0.68	0.00	3.20

Note. DES = Dissociative Experiences Scale; DFS = Dispositional Flow scale. SCS = Self-Control Schedule; BSI = Brief Symptom Inventory

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and was thus labeled "Depersonalization and Derealization". Factor 7 consisted of eight DES items reflecting memory loss and inability to recall personal information. It was labeled "Dissociative Amnesia". Factor 8 comprised all four DFS unambiguous feedback subscale items, which reflect one's clear sense about one's performance, hence, the original label was kept. Factor 9 consisted of all four DFS MoAA subscale items, which reflect a sense that things happen spontaneously and automatically, and again the label was unchanged. Factor 10 included four items from the DFS which portray the tendency to feel control over one's action, body, and skills, and was thus labeled "Sense of Control". Factor 11 included three of the four clear goals DFS subscale items, which assess the degree to which one knows what one wants to achieve, and it was thus labeled "Clear Goals". Finally, Factor 12 included seven DES items, some characteristic of DA and some general items which usually are not included in any scale; all of the items of Factor 12 reflect the tendency to split and alter consciousness in a way that seems to be reminiscent of Dissociative Identity Disorder features. Thus, the factor was labeled "Dissociative Identity Tendency" (DA-DID). Figure S1 presents the scree plot for EFA and Table S2 represents the correlations between factors.

Figure S1

Scree Plot for the Factor Analysis

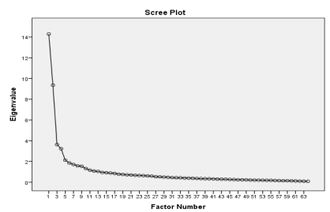

Table S2

Correlations Between Factors

	1	2	3	4	5	6	7	8	9	10	11
1											
2	.02										
3	-.18**	.18**									
4	.29***	.30***	.05								
5	-.29***	.29***	.31***	-.13*							
6	.43***	-.09	-.08	.21***	-.19**						
7	.57***	-.07	-.07	.24***	-.23***	.49***					
8	-.01	.39***	.18**	-.07	.41***	-.13*	-.08				
9	.10	.27***	.27***	.26***	.16**	.16**	.15*	.16**			
10	-.11	.33***	.22***	-.05	.39***	-.17**	-.06	.37***	.16**		
11	.07	.39***	.08	-.04	.40***	-.08	-.01	.55***	.15*	.41***	
12	.53***	-.03	-.05	.28***	-.18**	.37***	.35***	-.05	.12*	-.16**	.04

Note. 1= Absorption and obliviousness (DA-OBLIV; DES), 2= Challenging and rewarding experience (DFS), 3= Loss of self-consciousness (DFS), 4= Transformation of Time (ToT; DFS), 5= Enhanced concentration (DFS), 6= Depersonalization and derealization (DES), 7= Dissociative amnesia (DES), 8= Unambiguous feedback (DFS), 9= Merging of action and awareness (MoAA; DFS), 10= Sense of control (DFS), 11= Clear goals (DFS), 12= Dissociative identity tendency (DA-DID; DES). DES = Revised Dissociative Experiences Scale. DFS = Dispositional Flow Scale-2. In brackets are 95% confidence intervals $*p \leq .05$, $**p \leq .01$, $***p \leq .001$

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T-tests Comparing Groups

Table S3 presents bootstrapped independent-samples *t*-tests between the high and low trait DA groups, on several Phase 1 and Phase 2 flow/DA variables as well as SE. Regarding Phase 1, we used the original DFS subscales for this analysis, as the latent factors we presented above are based on the full Phase 1 sample and may not necessarily be accurate for this subsample. Compared to the low DA group, the high DA group showed significantly higher scores in dissociative variables, specifically, in MoAA and ToT (based on both Phase 1 DFS scores and Phase 2 FSS scores), and state absorption. Additionally, the high DA group showed significantly lower scores in SE (again, based on both the Phase 1 SCS subscale and Phase 2 state SE). Finally, the high DA group showed significantly lower scores in some of the non-dissociative subscales of flow (specifically, in sense of control as measured in both phases, and clear goals, unambiguous feedback, and concentration on task, as measured in Phase 1).

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Table S3

Bootstrapped T-Tests Between High and Low Trait DA, on Phase 1 and Phase 2 Flow/Absorption Variables

	Low absorption group *M (SD)*	**High absorption group *M (SD)***	**Mean difference [Bootstrapped 95% BCa CI]**	***se***
DFS-2 original subscales				
Challenge and skill balance	3.68 (0.64)	3.47 (0.84)	-0.21, [-0.574, 0.160]	0.18
Merging of action and awareness	*2.51 (.71)*	*2.992 (.73)*	*0.48, [0.132, 0.786]*	*0.18*
Clear goals	*3.94 (.57)*	*3.52 (.85)*	*-0.42, [-0.782, -0.055]*	*0.19*
Unambiguous feedback	*3.93 (.72)*	*3.42 (.97)*	*-0.52, [-0.922, -0.095]*	*0.22*
Concentration on task	*3.68 (.77)*	*3.01 (1.05)*	*-0.67, [-1.118, -0.207]*	*0.23*
Sense of control	*3.98 (.55)*	*3.21 (.91)*	*-0.77, [-1.125, -0.410]*	*0.18*
Loss of self-consciousness	2.97 (1.00)	2.75 (1.16)	-0.22, [-0.767, 0.287]	0.27
Transformation of time	*2.63 (.92)*	*3.52 (.83)*	*0.88, [0.455, 1.346]*	*0.22*
Autotelic experience	3.39 (.82)	3.58 (.82)	0.19, [-0.211, 0.637]	0.20
FSS				
Challenge and skill balance	4.09 (.75)	4.14 (.62)	0.04, [-0.284, 0.377]	0.17
Merging of action and awareness	*1.85 (.81)*	*2.53 (1.04)*	*0.68, [0.217, 1.158]*	*0.24*
Clear goals	4.32 (.67)	3.94 (.76)	-0.38, [-0.737, 0.022]	0.17
Unambiguous feedback	4.26 (.84)	4.00 (.70)	-0.26, [-0.620, 0.148]	0.19

Note. BCa= bias-corrected and accelerated. DFS-2= Dispositional Flow Scale-2. FSS= Flow State Scale.

Correlation coefficients for which the bootstrapped confidence interval excluding zero are italicized.