European Journal of Psychology of Education (2019) 34:1–24
https://doi.org/10.1007/s10212-018-0400-2

Persons pursuing multiple objects of interest in multiple contexts

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Received: 3 May 2018 / Revised: 13 July 2018 / Accepted: 26 July 2018 /
Published online: 31 August 2018

Abstract

Whereas much research on interest development focuses on single, predefined, and generic objects of interest (e.g., science) in specific contexts (e.g., science classroom), this study proposes a person-objects-contexts (i.e., P-O-Cs) perspective that accounts for idiosyncrasy and multiplicity of interests and contexts and consequent intrapersonal dynamics. It reports a multiple case study in which four students were followed for over 2 years in transition from secondary to higher education. Data collection included seven waves of experience sampling of daily life interest experiences with the help of a newly developed smartphone application (*inTin*) and four biographical interviews per student. Analysis concentrates on the intrapersonal dynamics in interest development when pursuing multiple interests in multiple contexts, with study choice as a specific example. Results reveal how students' multiple and diverging interests differ in across-context continuity, some being shared across school, family, and peer contexts. Academic and nonacademic interests are found not to be fixed and independent in their development, rather showing patterns of differentiation and integration in the interests over time. Moreover, students display parallel, sequential, and combined pursuance of interests in study and leisure time. We conclude how interest development is nonlinear and more fluid than typically theorized.

Keywords Interest · Multiplicity · Learning across contexts · Educational transition · Study choice

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Persons pursuing multiple interests in multiple contexts

Development of interest has since long been considered an important aim of education and a key condition for learning (Dewey 1913; Thorndike 1935). Interest refers to preferred engagement of a person in a particular object (be it a topic, idea, activity, or event; Hidi and Renninger 2006). Given its inherent focus on content, and associated intrinsic motivation and affect (Deci 1992; Krapp 2005), it is an important integrative construct that merges what has traditionally been studied separately.

There is increasing empirical evidence that interest is a powerful catalyst for learning and academic development. A vast body of research shows positive effects of interest on student engagement at school, perceived task value, better academic achievements, and timely degree attainment in specific educational programs (Hidi 2006; Patrick et al. 2011; Renninger and Hidi 2016; Tobias 1994). Moreover, interest is a significant factor in making sustainable choices in education and career (Eccles and Wigfield 2002; Harackiewicz et al. 2008; Holmegaard 2015; Maltese and Tai 2010). Recent phase-model theories have further contributed to a better understanding of how interests can develop from shorter to longer and more personal pursuits (Hidi and Renninger 2006).

Interest research, however, lacks theory on multiplicity of interests and of social contexts in which individuals experience and develop interests on a daily basis. In the educational and learning sciences, interest research has mostly focused on *single and generic objects of interest* in specific contexts (e.g., interest in physics developed in the physics classroom; Häussler and Hoffmann 2002). Although such focus allows to better understand and inform educational practices on targeted processes of interest-based learning, it also suggests a questionable simplicity and linearity when it comes to understanding interest development from a person's perspective.

At an individual level, interest development is complex and idiosyncratic (Krapp 2002a). Persons are unique in what specifically catches their interest in a particular situation (Silvia 2006), typically have multiple interests (Hofer 2010; Renninger and Hidi 2016; Su and Rounds 2015), and can pursue and develop interests across contexts (Barron 2006; Crowley et al. 2015; Maul et al. 2017; Neitzel et al. 2008). In this article, we propose to account for idiosyncrasy and multiplicity of interests and social contexts by what we refer to as a person-objects-contexts (i.e., P-O-Cs) perspective, so as to achieve a more comprehensive and detailed understanding of how individuals' interests develop in dynamic ways over time with various present and future orientations (e.g., study choice).

To our knowledge, there is no such comprehensive empirical analysis at the individual level, arguably because it is a methodological challenge to follow individuals with multiple interests across different contexts, while these interests and contexts cannot be known in advance. So far, interest research has been strongly divided by methodological approach, with large-scale research using surveys standardized across persons to identify patterns on an aggregate level versus small-scale, idiosyncratic research using ethnography and case studies to investigate persons' objects of interest in relation to a particular practice. With the credo to think big but start small, we conducted a multiple case study with repeated interviews and a new smartphone application that functions as a personalized experience sampling method (ESM) that can also be used at a large scale. Our long-term ambition is to combine the best of both worlds.

The aim of this article is to explore empirically what interest-based dynamics come to the fore with a P-O-Cs perspective, concentrating on four students during 27 months in their transition from secondary to higher education. In this transition period, one can expect to see dynamics in terms of how the students pursue multiple interests over time as well as weigh

these interests in making educational and career choices. In the following three sections, we introduce a P-O-Cs perspective to interest including a person-centered approach that accounts for a person's (P) multiple objects of interests (Os) in multiple contexts (Cs).

A person-centered approach (P)

Taking a person-centered approach to interest is important to acknowledge that individuals are essentially unique in how they experience and relate to the world. In line with wider recognition of individuals' multiplicity in goals, identity positions, and contexts (Aschbacher et al. 2010; Cross and Markus 1991; Hermans 2001; Kruglanski et al. 2002) as well as individuals' varying and unpredictable (i.e., nonergodic) longer-term developments (Molenaar 2004; Zittoun et al. 2013), there is increasing attentiveness to individuals as complex agents and legitimate units of analysis for understanding interest experience and development (Bergin 2016; Hofer 2010; Krapp 2002a).

In line with scientific attention for processes at the individual level, we see educational ambitions toward more personalized, interest-based, and connected learning and calls for more person-centered research (Ito et al. 2013). We should note, however, that the notion of person-centered research is easily misunderstood as describing differences between individuals also separate from their environment (e.g., using distinctive characteristics to group individuals). In our opinion and informed by cultural psychology (i.e., Hedegaard 2014; Rogoff 2003; Valsiner and Van der Veer 2000), a person-centered approach is about looking at within and from within persons to the practices through and by means of which they experience, engage, and gradually come to define and develop themselves.

Multiplicity of interests (Os)

Interest can emerge as momentary curiosity and focused attention of a person for something in a particular situation (Hidi and Renninger 2006; Krapp 2002a). Hence, we view interest as both a relational construct, relating person-object-context, and an experiential one, connected to real-world events. Research on situational interest has shown how similar situations can spark different interests in different people (Silvia 2006), indicating how interest is essentially a subjective and selective experience. Depending on further activity, valuation, and attachment, as well as social and cultural opportunity and support, such initial interest may develop into what are called individual interests. Individual interests refer to more enduring relations between a person and a certain object as displayed by a preference and persistence of the individual to re-engage in this object in particular contexts and perceived value of this object for the present or future life (Krapp 2002a, 2003; Renninger and Hidi 2016).

Considering how interest can emerge and develop from particular situations, it is important to acknowledge that basically anything in daily life can become a momentary or enduring object of interest, ranging from any topic, idea, material artifact, event, or activity that a person encounters. Nonetheless, daily life is organized culturally and historically in certain ways and, therefore, offers different opportunity structures and demands that make certain objects more visible, available, or attractive, while ruling out others (Hofer 2010; Hedegaard 2014). Hofer argued how such opportunity structures may shift with age and typical age-graded tasks. During adolescence, interests can be expected in relation to the large amounts of time adolescents commonly spend on school and homework, leisure, television, music, and on interest groups and socializing activities online (cf. Van den Beemt et al. 2011; Kleiber et al. 2014).

A relevant question following from this is what a person experiences as interesting in a variety of daily activities. Whereas interest research has mainly focused on studying single objects of interest in defined settings, daily life can be expected to generate multiple interests. At the same time, people typically show selective attention and motivation in daily activities (Kleiber et al. 2014) and pursue specific interests in relation to their deeper values and motives, and developing self-concept (Akkerman and Van Eijck 2013; Hofer 2010; Krapp 2002a). The configuration of interests becomes a way for adolescents (in particular) to define themselves as connected to, but also as distinctive from other peers (Krapp 2000).

Multiplicity of contexts (Cs)

Daily life consists of participations in multiple social contexts, that is, communities with more or less institutionalized practices (Hedegaard 2014). Adolescents typically participate in a family, various classes in school and study programs, peer groups, and online communities, besides a substantial part of time spent alone at home (Kleiber et al. 2014; Phelan et al. 1991). Over recent decades, peer groups have expanded from face-to-face contact to larger online interest groups and networking (Ito et al. 2013; Livingstone and Sefton-Green 2016; Van den Beemt et al. 2011). These social participations can all contribute to how a person develops over time, with specific identity positions and future aspirations (Akkerman and Van Eijck 2013; Lave and Wenger 1991; Wertsch 1993), and as such can be seen as constituting an ecology for development (Bronfenbrenner and Morris 1998; Cole 1996) as well as for learning (Barron 2006). In-depth case studies of interest development have shown how certain contexts can support a person in developing certain "islands of expertise" (Crowley and Jacobs 2002) or "lines of practice" (Azevedo 2011) in which people gradually come to belong to an interest-based community, attuning to related practices and conditions, while simultaneously developing a tailored version of participation and motivation that fits personal preferences.

An increasing body of research testifies to the ongoing identification and learning processes that might take place across contexts (Akkerman and Bakker 2011; Bronkhorst and Akkerman 2016; Guile 2006; Zittoun and Gillespie 2015). This also applies to interest-based learning, with display of interest, directed learning pursuits, and social selection processes found across social contexts (e.g., Barron 2006; Bergin 2016; Crowley et al. 2015). At the same time, research also shows that a person's social contexts can strongly differ epistemically and culturally, with practices showing distinct topics, activities, routines, rules, values, goals, and motives (Akkerman and Bakker 2011; Bronkhorst and Akkerman 2016). Accordingly, each social context may support particular interests and discourage others. Research focusing on people's multiple participations already revealed how different participations can be isolated and even conflicting, leading to the experience of discontinuities or so-called boundaries that can hinder further investment (Akkerman and Bakker 2011; Akkerman and Van Eijck 2013; Bronkhorst and Akkerman 2016). There is not yet a comprehensive understanding of how this applies to various interests of a person, as there is to our knowledge no research available tracing how persons pursue their multiple interests in and across multiple contexts.

Intrapersonal dynamics

We maintain that accounting for multiplicity within persons challenges a linear understanding of interest development. When faced with multiplicity, interests are no longer isolated engagements, but relative ones. Interest, particularly when well-developed, is associated with longer-term pursuits and purposes over time, along with the wish to become more knowledgeable in

related content, and goal setting in this direction (Harackiewicz et al. 2008; Hofer 2010; Renninger and Hidi 2016). Pursuing an interest over time goes hand in hand with self-determination and an increased sense of competence, autonomy, and relatedness (Hofer 2010; Krapp 2002b, 2005). Investment in an interest is rewarding as such (Renninger and Hidi 2016), but continued investment also implies spending time and effort on it, resources that are naturally limited in daily life. Accordingly, when a person has many interests, he or she is likely more challenged in distributing time and energy, even more so when these interests are linked to separate contexts and different practices.

Underlying such distribution and pursuance of interests are obviously more fundamental questions about how interests relate to people's motives and identity. Interest pursuits play a key role in how people make sense of themselves in the past, present, and future (Krapp 2002a), and present themselves to others with phrases such as "I have always liked to …", or "My current interests are …", "Later, I hope I will be doing ….". As people typically strive for a certain level of coherence and continuity in their identities, multiplicity of interests may also generate reflections and narrations about how interest pursuits in and across contexts fit or do not fit together in an epistemic sense, something that in turn may depend on what is culturally accepted in a certain society (Bruner 1990).

Personal challenges related to multiplicity of interests and contexts can become more salient during educational transitions, specifically when students move from secondary to higher education. Just before this transition, they need to choose a direction consequential not only in terms of subsequent years of study, but also as gateway creating as well as closing down certain options for a future career. Although interest is known to be an important factor in making sustainable study and career choices (Eccles and Wigfield 2002; Holmegaard et al. 2014), successful consolidation of interest is not self-evident. In the first year of higher education, most countries show high switching and dropout rates (in Europe typically ranging from 20 to 46%, Eurostat 2015; Quinn 2013). Besides more noticeable switching and dropout during study, there is also the phenomenon of regret; in the Netherlands, for example, about 20% of graduating students retrospectively regret their choice (Van der Werff and Berkhout 2015).

More generally, transitions are known to be periods of heightened reflexivity with individuals re-examining how they relate to the world and striving for biographical consistency (Bruner 1990; Caspi and Moffitt 1993; Ecclestone et al. 2009; Field et al. 2009). Multiplicity of interests within a person can be expected to challenge such consistency. Holmegaard (2015) recently found that making and narrating choices becomes more difficult when students have conflicting interests, for example not fitting well together in societal structures of occupational or disciplinary directions. This study aims to understand how multiplicity then may generate particular ways of pursuing and weighing interests in successive decisions for study and career.

Research questions

The aim of this article is to explore empirically what interest-based dynamics come to the fore with a P-O-Cs perspective. To be able to look at dynamics, we first consider (1) *what multiple interests students have (P-Os)*, and (2) *how these multiple interests appear in and across multiple contexts (P-O-Cs)*. We then investigate the resulting intrapersonal dynamics, asking: (3) *how do students pursue their interests over time, including when making an educational transition?* and, more specifically, (4) *how do students weigh their interests in relation to study and career?*

Methods

Methodological implications of a P-O-Cs perspective

Taking a P-O-Cs perspective on interest research has several methodological consequences. First, as stressed by Krapp (2002a) more generally, looking at interest development at individual level calls for combining microgenetic and ontogenetic levels of analysis. A microgenetic level of analysis concerns identifying processes and states of concrete interactions that are responsible for the developmental course, to identify, for instance, the emergence of new interests or changes in an existing interest. An ontogenetic level of analysis concerns identifying longer-term effects on the developmental processes. In this study, the microgenetic point of view comprises an investigation of how various interests emerge in and over time and how they appear in and across multiple contexts. From an ontogenetic point of view, this study considers the students' deliberate interest pursuance over time, with specific attention for the transition from secondary to higher education and related study and career choices.

A P-O-Cs perspective also requires a method for capturing whatever interests and social participations are reported by the person and tracing subsequent engagements in the objects of interest whenever they occur in daily life. Such an approach cannot rely on traditional standardized instruments with closed items and a single moment of measurement, but instead, requires an instrument for open and situated answers from a person's own perspective. As such an instrument did not exist when planning this study in 2011, we developed a smartphone application called *inTin*, designed for repeated reports of interests and social contexts on the one hand, and moment-to-moment reports within specific periods of time on interest-related events on the other.

Participants

Participants in this study were a convenience sample of four students. They followed a STEM (i.e., Science, Technology, Engineering, and Mathematics) program at Utrecht University during upper secondary education (aged 17, in grade 12) and then made the transition to higher education. Background information on the four students can be found in the Appendix. The longitudinal case study of these four students was part of a larger-scale research project on the STEM talent program taking place from 2012 to 2015 (Draijer et al. 2017). The STEM program was targeted at students in preuniversity secondary education with talent and interest in STEM domains, who were, according to their school, themselves and their parents, motivated to be educated in STEM-related school subjects at a more advanced level at university. The aim of the program was to support and deepen students' interest development in STEM, with the expectation that this would stimulate and facilitate them to go to university in a STEM-related direction after graduation. For the in-depth study reported here, we did not focus on students' STEM interests, but on all of their interests. On the basis of a questionnaire filled in by almost all students of the program, we identified eight different categories of possible interest development, such as from broad to narrow, from a specific interest to different specific interests, et cetera (Louwaard 2013). We interviewed one student for each category and invited each of these eight students to participate in an intensive longitudinal study, so as to ensure some variability in interest development of the participants. Four of them volunteered, giving informed consent. To ensure completeness of their reports and avoid attrition over time, students received a financial reward of €30 per wave and interview.

Data collection and instruments

The interest development of the four students was followed over time by means of seven so-called waves and four interviews. In Anne's case, wave 6 was missing because of an internship abroad with poor internet access. Figure 1 gives an overview of the data collection during 27 months. The main instrument for the waves was inTin, a smartphone application combining an open questionnaire with an experience sampling method (ESM; Hektner et al. 2007). First, before each wave, interests were measured with the open questionnaire by asking participants to enter all topics and activities that the person liked to spend time on. This created a list of interests at the start, complemented by interests added during the subsequent 7 days of experience sampling. Beginning with wave 2, participants were asked to indicate for each entered or added interest the personal value of the reported interest by means of a slide bar with a scale of 0 (not important) to 100 (very important). For the first wave, the personal value of the interests was asked afterwards in the follow-up interview.

Second, in the open questionnaire at the start of each wave, participants were asked to list all frequent and significant others and groups of participation and to indicate with a slide bar the personal value of each contact and group on a scale of 0 (not important) to 100 (very important). For every group, they were asked to indicate which of the individual contacts were members, leading to what in social network theory is referred to as an ego-network of this person (Everett and Borgatti 2005).

Third, situated engagements in objects of interest were measured in the form of a wave or so-called ESM measurement burst during 1 week, prompting persons to make reports every 2 hours during the day on whether time had just been spent on one or more of the entered or to be added interests, and if so, for each interest, with whom and how (by what medium) they discussed or performed the interest, and how they valued the event on a scale of 0 to 100 (slide bar ranging from "not interesting" to "very interesting"). In reporting with whom they discussed or performed the interest, they could select "alone," "an individual contact," or "a group," using the network list they had already entered. For every report, students were asked to describe what they thought, discussed, or did and what they found to be of lower or higher interest in this instance. They were invited to add pictures, movies, or audio files as well.

The audio-recorded interviews consisted of questions about the participants' educational trajectory and their interests. With regard to their educational trajectory, students were asked what they considered after secondary education and for what reasons (interviews 1 and 2) and, after making the transition, how they experienced their current study and what they considered at master level (interviews 3 and 4). As to their interests, students were also asked in interviews 2, 3, and 4 to elaborate on the interests they had reported in the preceding inTin wave regarding (1) the origin of the interests (when and how did it emerge) and (2) the typical way of interest engagement (when, how, and in what social context(s)). The interviews (transcribed verbatim)

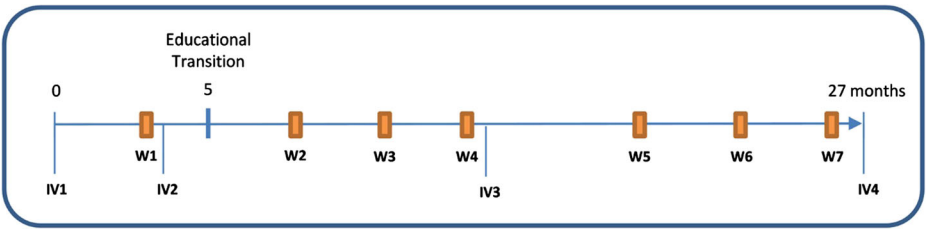

Fig. 1 Period of data collection. *Note*. W = wave with reports of parallel interests, social network, and subsequent interest engagement during 7 days at 2-h intervals. IV = interview

helped us validate and contextualize the data collected with the inTin app. Interviews 1 and 2 revealed that all four students considered several study directions. To gain insight into students' weighing and pursuing of interests, they were asked for what reasons they considered these studies and, if applicable, to elaborate on their doubts. As expected, most reasons were related to their interests as well as underlying preferences, values, and goals.

Data analysis

Given the exploratory nature of this study, our analysis mainly aimed to describe the data and to identify notable patterns within and across the four students. To answer research questions 1 and 2, we constructed with the help of a Master's student in the Educational Sciences spreadsheets of all interests and contacts reported by the participants at the beginning of a wave and spreadsheets of all interest events. For each participant, we made and checked one spreadsheet in which the following variables were listed per wave: interests, explanation about these interests, score of their importance as filled in at the beginning of a wave, and the participant's social network (contacts and groups). These spreadsheets allowed us to identify and count the configurations of multiple interests of the students during the waves, with descriptives of the amount, nature of object (i.e., topic, activity), value, and domains of multiple interests, and thus allowed us to answer research question 1.

For the second question, we considered the significant others and groups as indicative for the types of social contexts, exploring in the relevant spreadsheets with whom interests were shared and potential differences between interests therein. This analysis did indeed reveal differences between contexts in terms of variety of interests being shared, as well as differences in the extent to which interests were shared across multiple contexts.

For the third question, we combined the data from the inTin app with the interview data in new spreadsheet files, again chronologically per participant. With color codes, we indicated for each participant which interests and which social contacts and groups were reported before and after the transition to higher education. Reading from wave to wave and collaboratively analyzing the spreadsheets allowed us to identify the interest configurations over time and to explore whether, when, and how existing or emerging interests were pursued. This revealed several longer-term interest pursuits for each student. Next, we did a cross-case analysis (Borman et al. 2006) in which we identified three types of changes in the object of interest as described in the "Results" section.

For the fourth question, we made new spreadsheet files in which we listed all study choices considered by the students and the related interests, as well as reasons that the participants gave for or against a particular study choice. This overview helped us analyze how students weighed

Table 1 Structure of the analysis of educational choice in relation to interest (three of Anne's rows out of 73)

Educational choice considered	Reasons	Related to interests	Aligned with this choice	Discussed with
Medicine	Wants to work in a hospital	Medical matters, medical info, medicine (as a discipline), medicine as a university program, medical knowledge	Yes	Friends, mother
Medicine	Specialist has little time for patients	Helping people, having social contact	No	Sister
Nursing	Appeals to Anne's social skills	Helping people, having social contact	Yes	Friends

Table 2 Number and value of interests across waves

	Number of interests across waves		Value of interests across waves (0–100)		
	Median	Range	Median	Mean	SD
Anne	14.5	11–16	51	51.4	21.3
Casper	9	7–10	59	60.8	17.6
Elise	18	12–30	67	65.9	25.6
Roos	12	10–16	67	67.1	8.1

their interests in relation to study and career, identifying interest-related reasons and potential doubts for considered directions in higher education in interviews 1 and 2 (Table 1 illustrates this step) and identifying potential reconsiderations of their choice after transition in interviews 3 and 4. Both authors were involved in the analyses for the four questions, collaboratively identifying the patterns presented in the "Results" section.

Results

Multiple interests (RQ1)

The configurations of interests of the students in each wave show that they consistently had multiple interests with a high personal value in a variety of domains. As visible in Table 2, the number of interests reported by the students in one wave ranged between 7 and 30. Whereas Anne, Casper, and Roos reported rather stable numbers of interests, Elise reported a much more variable number of interests across the waves, which seems to be caused mainly by interests of a

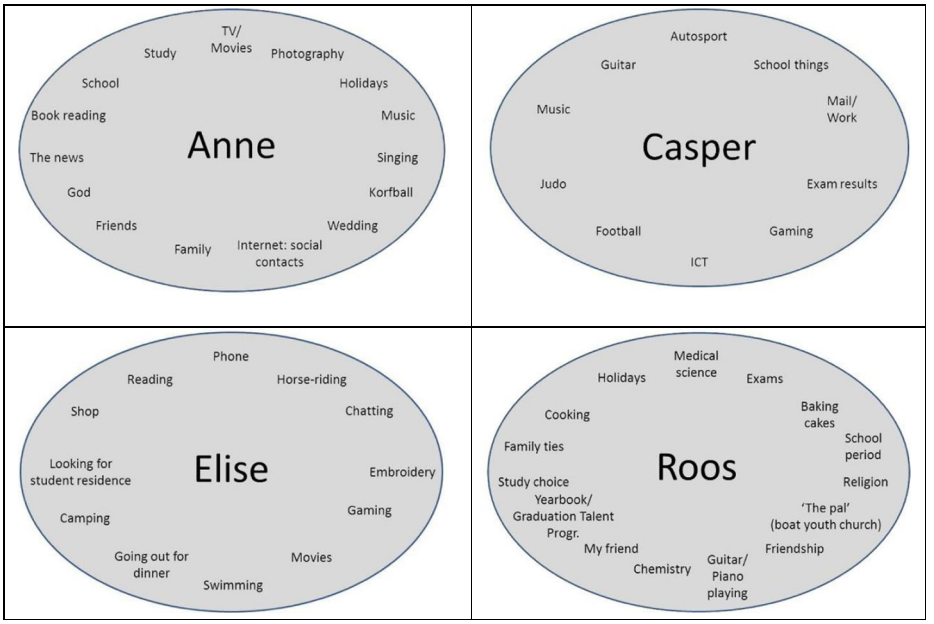

Fig. 2 Multiple interests of students in wave 1 (before transition to postsecondary education)

momentary and situational nature (e.g., a particular wedding, holidays, a party) not reported at other time points. Half of the interests were indicated by the students to have a personal value above 50 on a scale up to 100.

Figure 2 exemplifies the multiple interests reported by the students in wave 1. Interests consisted of both topic-based and event- or activity-based objects and related to different domains, including the academic domain (i.e., in terms of school or study, specific subjects, or disciplines), work, as well as sports and other leisure activities. A special case of reported leisure interests concerns consumptive media (e.g., television or books) which for students seemed to be related to a way of relaxing, but also turned out to be oriented toward multiple topical interests. For example, Anne reported watching hospital series, and Casper watched television programs about cars, sports, music, computers, and forensic investigations and crime.

When it comes to academic domains, students did not just report STEM-related interests but also reported having one or more interests in either the social scientific or medical science domain. This multidisciplinarity is most clearly visible for Roos in later waves, where she reported interests in medical science, psychology, biology, and chemistry next to nonacademic interests such as friends and relationships.

Interests in and across contexts (RQ2)

Prominent contexts comprised family (close and sometimes more distant relatives) and multiple peer groups, including peers related to school, to study, and to certain leisure activities and institutes. In the initial waves, all four students reported to have a peer group specifically related to the talent program that they followed. Some additional groups reported were related to a side job or to church. A few persons appeared to belong to multiple groups. Casper for example reported two friends at his secondary school who also followed the talent program.

Students reported engagement for most or even all of their interests during the weeks they made moment-to-moment reports, although frequency of events varied between the interests. This frequency seemingly depended on the typical opportunity and habitual nature of the interest (e.g., listening to music is easier on a daily basis than is horse riding).

We highlight several findings, also illustrated by Fig. 3. First of all, for most interests, though they were shared with others, engagement in the object was also regularly alone; of the total reported interest events, the percentage of interest-related events indicated as alone is 29% for Anne, 37% for Casper, 39% for Elise, and 37% for Roos. This shows the complementary role of the private sphere alongside the social environment in pursuing interests.

Second, we found some interests to be mainly pursued in the group that has this interest as its principal object, such as Casper talking about or doing judo mainly with the judo peer group. As expected, the peer group from the talent program is a context in which more specific academic and STEM-related interests appear. When elaborating on their interests in the interviews, students all mention the talent program peers to be people with whom they can better and at a more detailed level share their STEM-related interests (e.g., the Higgs boson, a new technological development in touchscreens, the effect of strawberries on heart attacks) than with other peers. Casper and Roos both mentioned how they did not feel inclined to share such interests with other peers, because they would typically react by saying “I do not understand,” “I do not want to know,” or “please, you may stop talking now.”

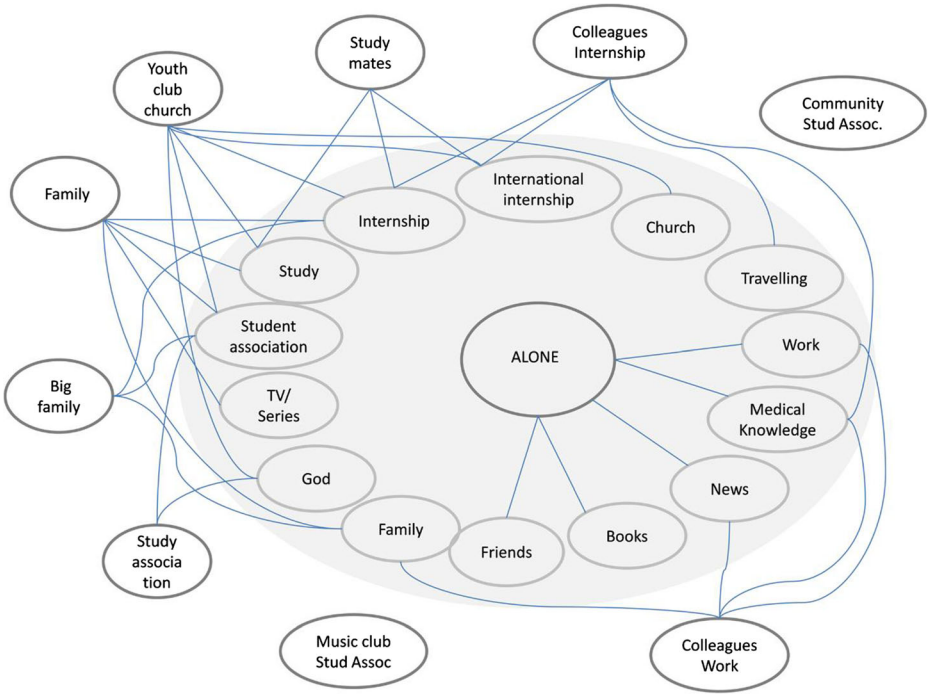

Fig. 3 Interests of Anne in wave 5 shared in and across social contexts. *Note*. A line represents one or more events of interest-related activity (including thinking or talking about the interest) alone or with (part of) a group that Anne listed as frequent or significant context of participation

Third, we found some groups—mainly the family—with whom multiple and diverging interests were shared. For Anne, the family of her boyfriend appears to be an additional group of people with whom she discussed many of her interests, yet this context disappeared when her relationship with her boyfriend ended later on during her study.

Last and vice versa, single interests were also shared with multiple groups (e.g., family and various peer groups) within a week, indicating across-context continuity of interests. Interests seem to differ in the extent of such across-context continuity, with some interests frequently recurring in or consuming their daily lives (e.g., Casper's daily listening or talking about "music," "exam results," and "study choice" for all students; Roos her ongoing thoughts about "relations"; Anne's talk about "God" and "religion"). These interests seem to travel easier across contexts than interests that are tied to a collective practice and context (such as horse riding, judo). Worth noting is that Casper likes listening to music when traveling from one to another context (between home and university). A more goal-directed illustration of across-context continuity is formed by Anne's recurrent reports on medical issues. In her first interview, she already mentioned this to be an interest she had pursued during her whole life, putting bandages on dolls when she was little, enjoying any visit to the hospital despite unwelcome reasons for her family for going there, frequently talking about medical phenomena in different social contexts, watching television programs on hospitals, medical emergency units, or labor practice, and always searching for information about particular diseases and symptoms whenever someone close to her was ill.

Interest pursuits over time (RQ3)

There are two main findings regarding the way interests were pursued over time. One is that every wave shows interests appearing and disappearing, yet with the greatest changes after the first wave, when students made the transition to higher education. Changes include new interests marking the new phase for the students, with interests related to academic topics and disciplines, side jobs, and new leisure activities with peer students from study or college dorms. Some of the previous and longer-term leisure interests in secondary education disappeared, yet with most of these interests reappearing later on during the students' study. This indicates how interests can be latent, probably temporarily dominated by the student's new and all-consuming life situation.

The second main finding is that various interest pursuits can be identified for each student over time (i.e., ranging between 8 to 18 interests reoccurring in three to seven waves), yet with most pursuits showing various kinds of variation or transformation. The first kind is a matter of only slight *categorical variation*, with minor changes in wording and in what aspect of the interest is emphasized: its topic, activity, medium, or function. Examples of such variations are "reading a book"-"books"-"book" [Roos], "friendship"-"relationships" [Roos], "drinking tea"-"tea"-"have a little cup of tea" [Elise], and "post/work-work-working" [Casper], "gaming"-"games" [Casper], "God"-"religion/God" [Anne], "medical issues"-"medical info"-"medical knowledge" [Anne]. We have no indications that such adaptations suggest actual changes in the interests. For example, "tea" might as well be shorthand for "drinking tea." It is worth noting how students regularly switch between nouns and verbs (e.g., games versus gaming). In the literature, there is discussion about whether activities should be included as possible objects of interest. For example, Schiefele and Rheinberg (1997) only refer to epistemic interests, not to activities or events. Our data suggest that from a person's perspective, topic or activity interests may be more fused than scholarly distinctions and discussion suggest (cf. Krapp 2002a).

A second kind of transformation is *differentiation* of an interest into more specific versions of the initial object of interest. A nonacademic example is Elise's initial interest in "household stuff" differentiating into "cleaning" or "tidy" besides "grocery." Academic examples are Elise's initial interest in "learning" differentiating into "learning" and "lessons" and then into "study," "homework," "college," and "working on an assignment"; and Anne's initial interests in "study choice" and "study" splitting up into two specific study directions (one being continued, the other being the considered alternative as explained later), and for the continued direction splitting up further into "study," "internship," and "foreign internship."

Differentiation can also mean expansion because more interests emerge related to the initial category. Three apparent expansions into more specific interests are Casper's continued interest in "judo" later being reflected in a new and separate interest labeled "referee (judo)"; Anne's initial and continued interest in "God" being reflected in new and separate interests of a religious nature (i.e., "youth camp church," "the church," the specific name of a religious conference she is organizing); and Roos' interests in "guitar/piano playing," "music playing," and "music listening" being reflected later in a new interest "writing (songs, poems)."

A third kind of transformation in the interest pursuits is the *integration* of interests. This was most explicit in pursuits where initially separate interests were later literally mentioned together; for example, interests of Elise in "films" and "series," of Casper in "car racing" and "motorbike racing," and of Roos in "baking cake" and "cooking," later being reported by them as, respectively, "film/series" or "series/films," "car/motorbike racing," and "baking

Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6	Wave 7
chemistry	chemistry	chemistry	chemistry	chemistry	chemistry	chemistry
						prepare drugs
medicine	medicine	medicine	medicine	medicine	medicine	medicine
	biology	biology	biology	biology	biology	biology
	psychiatry/ neurology					
		psychology		psychology	psychology/	psychology
	relationships	relationships	relationships		relationships	
friendship						

Fig. 4 Transformations in several interest pursuits of Roos over seven waves of data collection

cake/cooking" and "cooking/baking." Combining the terms suggests that they perceive them as similar in terms of object and/or type of engagement.

Integrations between interests also appeared to occur more subtly. For example, Fig. 4 illustrates how Roos' initially separate academic interests seemed to be integrated in later interests. She mentioned drug preparation as a specific activity of interest at the intersection of longer-term interests in chemistry and medicine. Furthermore, starting in wave 2, she expanded the category of friendships to relationships as, so she explained in interview 3, being the more general phenomenon she likes to think or talk about, not only with reference to specific friends. She also started reporting an interest in psychology which, as explained in interview 4, referred to her interest in the broader academic discipline that among others, studies how relationships between people work. In our interpretation, Roos' interest configurations fluidly transformed into new configurations. For example, the interest in psychiatry and neurology that she mentioned in wave 2 is the biological and medical side of psychology. This implies another integration of initially separate interests.

Weighing of interests in relation to study and career (RQ4)

Analysis of the students' considered study directions and reasons for these directions indicates how the multiplicity and divergence of interests form a challenge for students in making a choice and being satisfied with it after transition.

Considering various directions Prior to transition, the four students all considered various directions and had doubts about what should be their choice. Anne had considered medicine, nursing, obstetrics, and nursing in combination with pedagogical sciences, pedagogical sciences, and academic teacher education (for primary education). Elise had considered econometrics, medicine, biomedical sciences, technical mathematics, and physics. Roos had considered medicine, biomedical sciences, psychobiology, economy, econometrics, and mathematics. Casper had considered computer science, chemistry, mathematics, and a double bachelor of computer science and mathematics.

Positive and negative interest-based reasons The reasons of these students point to positive and negative interest-based reasons for each of the considered directions. The interests considered in this weighing were not just academic, but often also nonacademic. For example, Anne had explored teacher education and child studies because of her interest in children, whereas medical sciences, nursing school, and obstetrics all fitted her interests in the human body and healthcare. She had some doubts about medical sciences, however, because she expected to have less direct contact with patients as a doctor than as a nurse, which she argued was underlying many of her interests. In terms of nonacademic interests, Anne (like Roos) worried that choosing medical sciences implied an intensive and long-term trajectory, whereas she wanted to save enough time for other interests and a family life.

Casper considered computer science following his interests in computer technology, chemistry following his interests in forensics, and mathematics given his interest in this subject. Casper was initially enthusiastic about a double bachelor in computer science and mathematics, which would allow him to combine related interests. However, he quickly dismissed the double bachelor program after he discovered the dominance of mathematics courses, whereas he preferred a focus on technology and computers more than mathematics. Moreover, a double bachelor program would harm his leisure time to spend on other nonacademic interests that were important to him (firefighting, judo, social events).

Roos regarded both biomedical sciences and psychobiology as fitting her scientific interests in biology and chemistry, but as too specific and not in line with her social and religious interests. She did consider medical sciences as being more oriented to social contact and helping people; however, she doubted whether medicine would be scientific enough. Elise had doubts about medicine not being technical enough, yet vice versa about technical mathematics as being too theoretical and lacking immediate relevance for her.

Pursuing multiple interests in combination, in parallel, or in sequence Ultimately, the four students preferred and chose the study directions they argued were broad enough for them to combine several of their interests and still permitted making more specific choices later. Anne decided to opt for medicine studies as the broader study best fitting her interests in the workings of the human body and healthcare in hospitals. After not being selected, she chose nursing above obstetrics, arguing that nursing is broader and better allowed transition to obstetrics rather than the other way around. Roos also chose medicine because of its broad nature, being the best option for combining her scientific, social, and religious interests and leaving open various career options such as pediatrician, neurologist, or psychiatrist. She discovered a research master she could start in her second year parallel to her medical studies to learn doing research alongside the general and practical nature of medical science. In choosing computer science, Casper reasoned this was a broad enough study for later specializations and combinations with biomedical work and forensics. Elise initially searched for a broader study in which she could combine her interests in medicine and mathematics. Not finding any study that would allow such combination however, she realized econometrics was the ideal alternative, because of its applied nature of mathematics, balance in theoretical, practical, and human work, and still including a broad range of career directions.

After transition, students continued searching for ways to pursue and combine their various interests either in or outside of their study. This was most explicit for Anne, who continued having doubts about her nursing study, missing a more advanced level of medical knowledge and hospital work. For this reason, she continued with selection procedures to try making the shift to medical science. At the same time, she managed to broaden her study by following two tracks, choosing a heavy internship in a surgical department at a Dutch hospital as well as an

international internship in a small African hospital treating children at medium care level. Although the other three students were generally satisfied with their study, they also searched for ways to enrich or complement it. Elise and Roos both started an honors program, although this did not turn out to challenge them in developing their interests in the way they had hoped.

All four mentioned the importance of pursuing certain interests outside of study, for leisure and relaxation and for being complementary in nature to the content of their study. Elise mentioned how several leisure interests allowed her the creativity and practicality she missed in her study. Anne mentioned missing mathematics in her study but found a way to focus on that interest in her tutoring of students in secondary education. Casper described to pursue deliberately his interests in judo and working because it allowed him to develop social skills, which was something he noticed missing in the typical "socially awkward computer science student," as he called it.

Looking forward near the end of the second year bachelor, only Casper was certain about what he would do after his bachelor study. He had first doubted between shifting to a university of applied sciences where he discovered a master digital forensics and an academic master at another university on computer security. He was enthusiastic about both masters because they allowed pursuing his academic interests in computer science, biotechnology, ICT, and mathematics as well as his nonacademic interests in crime and forensic research. These latter interests had been evident in his recurrent reports of watching mythbuster and crime-scene investigation-type programs and what he related to his interest in firefighting and his general preference to help other people. He finally opted for the master computer security, being the broadest and more advanced master of the two. Roos mainly doubted between doing a clinical or research master and considered the option of doing both in parallel in order to pursue all her medical, science, social, and religious interests. In terms of career orientation, she became more specific in the wish to become a pediatrician. Elise was still in doubt about three potential masters following her bachelor in econometrics, reasoning that each of them would lack the interesting content offered by the other, but expected her choice would sort itself out in the next year. Anne was still heading for a medical science study after her nursing bachelor, yet now with a more specific orientation to specialize in tropical medicine for combining her interests. She remained however dependent on passing the selection procedures.

Taking together the weighing of interests to pursue before and after transition to higher study, students seemed to search for ways to pursue multiple interests either in combination into one study direction, in parallel (e.g., in two parallel study programs or in leisure time parallel to study), or in sequence (first study X, then Y).

Conclusion and discussion

Reflections on the four questions' themes

To account for multiplicity within persons, we have proposed a P-O-Cs perspective to study interest development, investigating four themes in this study: (1) persons' multiple interests, (2) in and across multiple contexts, and subsequently the intrapersonal dynamics of each student in (3) pursuing interests and (4) weighing interests in relation to study and career.

Multiple interests The multiplicity and diversity of highly valued interests calls into question the typical image and labeling of students according to their profile in educational settings only, often suggesting groups of students based on a disciplinary orientation (arts and humanities versus

natural sciences). It should nevertheless be noted that the students in this study had obvious talent and interest in STEM subjects as well as highly supportive family contexts. It is possible that they had divergent interests because of a generally high level of interest and larger capacity than students with average degrees of talent and interest. We recommend further research across levels and groups of students to see to what extent multiplicity and divergence of interests is a common phenomenon, or possibly, whether groups of students can be distinguished in this respect.

Multiple contexts Besides a large part of interest events taking place alone, several interests were situated mainly in one interest-related social context (e.g., judo being shared mainly with a judo leisure group). This shows how interests can be strongly embedded in a more or less institutionalized community and practice, offering the opportunity for, but also giving meaning and direction to interest pursuits (cf. Azevedo 2011, 2013a, b). In such cases, it becomes difficult to distinguish an interest from the social participation in a particular practice and related places and materials, because it is then the "totality of one's experience" that generates the interest experience (Azevedo 2011, p. 151). This also implies that studying how or why such an interest develops or declines over time requires additional insight into how the related practice is organized and someone's position in it (cf. Bergin 2016).

Besides interests that were strongly embedded in single social contexts, we also found interests that were clearly pursued across multiple social contexts. This appeared to be the case for interests showing personal routines independent from site or time (e.g., a habit to listen to music throughout the day or drinking tea when possible as recurrent points for relaxation) but also for interests relating to dominant goals or values (e.g., being an active Christian). This testifies to people being agents that, as Bergin (2016) proposed, may display their interests to significant others and involve them in these interests.

Why and how interests vary in continuity across multiple contexts deserves much further research as continuities across contexts are known to be consequential for learning and further investment (Akkerman and Bakker 2011; Akkerman and Van Eijck 2013; Bronkhorst and Akkerman 2016). This also appears the case for interest-based learning, as for example, Hinton and Kern (1999) showed that the rate of students doing homework increased from 60 to 95% when students' out-of school interests were incorporated in assignments. Understanding across-context continuity of adolescents' interests then becomes key for realizing interest-based and connected learning within and beyond education as proposed by various scholars (i.e., Ito et al. 2013).

Following the findings in this exploratory study, we argue that across-context continuity in interest pursuits is dependent, first of all, on the mode and motive of the pursuit. It appears that this mode and motive can reflect different levels that we propose can be related to Leontyev's (1978) systemic distinction between *activity*, *action*, and *operation*. Interest pursuits may range and develop in various directions from (a) routines of the person at an operational level (e.g., a habit to sing during the day) that can be more or less context-dependent to (b) conscious and goal-directed pursuits at the action level (e.g., practicing a particular song) that a person may or may not take forward across contexts, to (c) pursuits embedded in collective activity (e.g., a choir), where the interest is more or less shared, directed, and bounded by a particular community and practice, so making it more context-dependent, yet such interest-based practice may still be displayed by the person or asked about in other contexts exactly because it is considered important for this person.

Second, we have the impression that across-context continuity depends on the transportable and permeable nature of the mode and object of interest itself. More specifically, we propose that interests can be more or less transportable in an epistemic sense (e.g., connecting to common versus specialized knowledge and jargon), temporal sense (e.g., more or less associated with a

particular time and rhythm of the day, week, or season), geographical sense (e.g., more or less connected to place(s)), material sense (e.g., more or less mediated by physical artifacts), cultural sense (e.g., more or less informed by norms, values, and carrying history), and or institutional sense (e.g., more or less connected to organizations or memberships), and through these dimensions can be seen as more or less common in a given society (e.g., the general public being familiar with neither the interest nor the related jargon, places, rhythm, or history).

Third, we argue that across-context continuity of an interest depends on opportunity and social support provided in various contexts, ranging from others showing interest in one's interest(s) to active brokering that leads to additional and potentially shared opportunities to pursue interest(s). These others may in an epistemic sense, for example, allow or show efforts to learn related knowledge and jargon; in a temporal sense, allow or create more time and rhythm for pursuing interest(s); in a geographical sense, visit or even create relevant places; or in a material sense, provide the financial means or interest-related tools to support further engagement. Such tools may also come to function as boundary objects (Star 1989) by means of which exchange and alignment across contexts is supported (e.g., a student portfolio between school and work or digital tools as described for example by Akkerman, Admiraal, Huizenga 2009; Akkerman and Bakker 2011; Ito et al. 2009). It is in this third respect of social support that family is often found to be the most significant context in which a child or adolescent can discuss personal interests and ask or find support for them (Crowley and Jacobs 2002; Crowley et al. 2015). What resonates with this idea is our finding that the family was a context in which all four students shared multiple interests, and so these appeared to be very supportive families. As proposed by Maul et al. (2017), research on a larger scale may help to discover how support differs for different social contexts and, as we would like to add, also whether and how there may be more generic or selective opportunity and support in a social context for multiple interests of a person (e.g., the family who supports the interest in biology, but not the interest in theater play). Relating this to interest development over time, one may question whether interests with more or less continuity across contexts show different patterns of development over time than interests that are discontinuous (i.e., isolated in one context only).

Intrapersonal dynamics Moving to the third theme, on dynamics in interest pursuance over time, we found appearing and disappearing interests as well as interests being pursued over a longer period of time. Regarding the appearing and disappearing interests, the most notable changes were seen in the transition from secondary to higher education. This was in line with our expectation, as transitions are typically periods for reorientation and reorganization of daily life, in this case involving a new educational program, living situation, and associated changes in position and social network. Regarding interest pursuits, several interests re-occurred over time for all students, yet also with three types of transformation in the object of interest: variation, differentiation, and integration. We had not anticipated such changes in interest pursuits, although they resonate with an idea of potential growth patterns proposed by Krapp (2002a) based on several earlier studies: a growth, channeling, and overlap model referring to, respectively, increasing knowledge and specification, shifting attention, and integration of objects of interests. What can be concluded from our findings and Krapp's earlier studies is that interests should neither be seen as static nor as independent objects. Instead, as illustrated in our data in Figs. 4 and 5 as an abstract visualization, the content of interests may develop more fluidly also in relation to other interests, even when such interests are related to other domains and disciplines.

Weighing interest pursuits in choosing a study program The fourth theme concerned how students weighed their interests in choosing study and career. In line with previous research, we

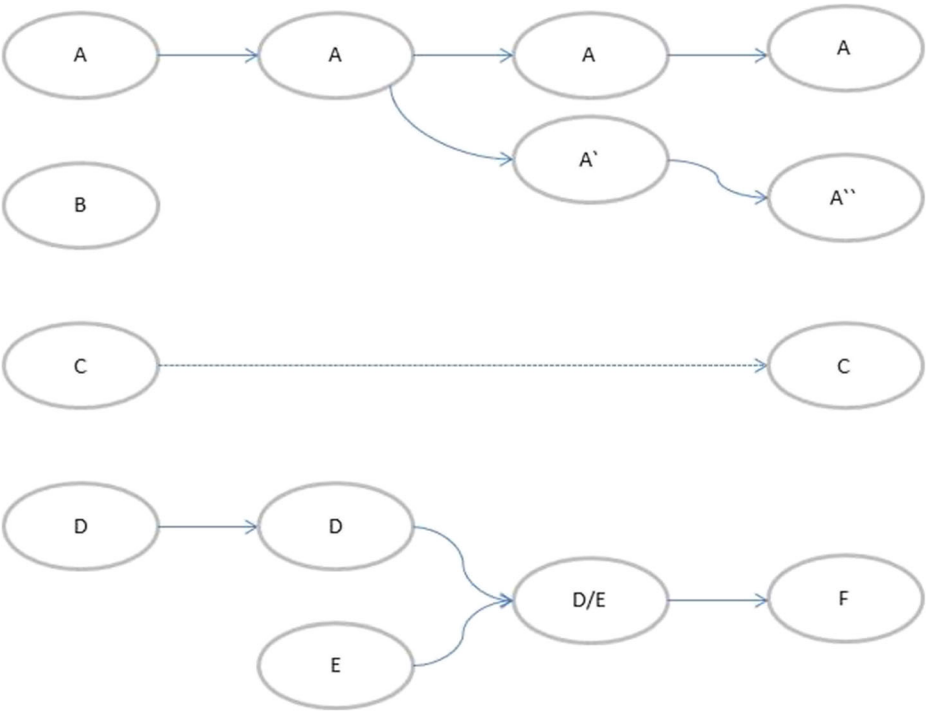

Fig. 5 Potential patterns of fluid interest development

found interest to be an important factor for students in study choice. However, this factor proved to be complex due to the multiplicity and divergence of interests, as testified by conflicting interest-based reasons for alternative study directions. Both the reasons prior to transition and considerations after transition suggest that students, rather than selecting or prioritizing interests, search for ways to pursue most of them, either by combining interests into one study, pursuing interests in parallel (e.g., in two studies; or in study and leisure time), or pursuing interests in sequence (e.g., first some interests in study X and then other interests in a subsequent study Y).

In practice, pursuing interests in such ways may not always be feasible. The strategy of pursuing interests in parallel programs or participations is likely to be dependent on the individual's capacity to manage this in terms of multiperspectivity, time, finance, and energy. The plausibility of combining or sequencing interests in study is also dependent on the organization and opportunity structure of higher education. For example, combining interests seems more likely in educational institutes and programs that are broader and multi- or interdisciplinary in nature than in institutes and programs that are monodisciplinary. In the case of Casper, it was only due to existing interdisciplinary master programs that he saw opportunities for combining several of his academic and nonacademic interests. Likewise, sequencing interests in programs is dependent on the educational routes and tracks toward graduation that institutes and programs offer or accept.

Limitations

Our longitudinal P-O-Cs analysis comes with limitations, such as the small-scale descriptive nature of this study and the specific educational level and talent of the four participating

students. This means that the found levels of multiplicity and divergence in interests and contexts and the types of interest development such as categorical variation, differentiation, and integration we have identified cannot yet be assumed for other students.

A methodological limitation of this study may be the complete reliance on the person's own perspective and immediate reports of interest experiences. Students might not be aware of all of their interests, significant others, and groups during reports or may not be so deliberate in the labeling of their interests. Minor categorical variations in the name of the interests indeed appeared less telling. On the positive side, we argue that the immediate reports of interests with the inTin application provide a much more nuanced and ecologically valid picture than typical questionnaires filled in within a school setting and with predefined interest categories. The approach we used allowed us to see for example how experience of interest may also cut across well-delineated cultural categories (e.g., related to subjects or disciplines in the academic and nonacademic domain) typically used in interest research, and how these categorizations of interest experience can also change over time. Taking into account the interviews in which students elaborated on interests in prior reports, the patterns of differentiation and integration of interests appeared to reflect actual changes in students' orientations.

A second limitation of the current study is that it cannot yet explain across-continuity of interests in terms of the systemic levels and contextual dimensions that we have proposed above in the discussion. Such explanation moves beyond the person's immediate perspective and requires more structural shadowing of persons or multisite observations of settings and wider practices in which interests are mediated and supported. We propose that further research can use persons' situated reports of interest-related actions and interactions (e.g., by means of the inTin application) to identify across-context continuities and discontinuities for more detailed in multisite studies of persons' practices in school, family, and peer group.

Concluding remarks

Although the study presented here was small scale, we think that the inTin application can be easily used on a large scale. This would bring together the best of two worlds: the detailed idiosyncratic information from a person perspective as well as possible patterns and trends one may find at an aggregate level. A first larger-scale study using the inTin application has been successful already (Slot et al., 2018). Altogether, the findings of this study form a first proof of principle, testifying to the value of a P-O-Cs perspective to study interest development, and showing empirically how persons also develop interests in relation or competition with other interests in and across several contexts of school, family, work, and peers. Acknowledging this multiplicity can help to understand the nonlinear and fluid nature of interest development that was already suggested in theoretical papers by, for example, Bergin (2016) and Hofer (2010). More specifically, a P-O-Cs perspective allows to see and study potential multilinearity (i.e., the possibility of persons to pursue different interests and directions at the same time), equifinality (i.e., the possibility of pursuing a particular interest and direction as a follow-up and integration of various prior interests), or multifinality (the possibility to pursue one interest in different directions). The multiplicity also shows the importance for educational and learning research to extend the unit of analysis beyond a designed or predefined domain and context. If the aim is to understand interest development, we should approach it not only as a lifelong but also a life-wide process, with the person as a significant and moving unit of analysis, and the one through which we can discover how multiple interests develop in multiple contexts.

Appendix

Background information on the four students derived from motivation letters for the program [in grade 10] is summarized in the table below. What the four students have in common is: living in intact families, rather high socioeconomic status, 17 years old in grade 12 at the start of the study

Table 3 Background information about case study students

	Family	Religion	School	Personal	Leisure activities	Future dreams [in grade 10]
Anne (female)	Parents and 4 siblings: "there is a lot of teasing and laughing, but most of all loving each other"	Active Christian (going to church, church-related activities)	"I am a bit frustrated that I learn so little at school"; "school focuses only on facts"	"I enjoy being with children"	Korfball	Mother, teacher, midwife, or medical profession
Casper (male)	Parents and younger brother	N/A	Bilingual school; "the lessons at this moment are rather boring"	"I like problem solving"	Judo, firefighting, music	Forensic researcher, firefighter
Elise (female)	Parents and 2 siblings sister	N/A	"STEM subjects have my main interest but I also like the other subjects"	"I like going deeper into things"	Horse riding (care horse), music	Medicine (in grade 10) switching to something more mathematics (econometrics)
Roos (female)	Parents and 2 siblings	Christian	Bilingual school (Dutch and English)	"I am happy, curious, optimistic, and both a thinker and dreamer"	Horse riding (care horse); be with friends, shopping	Marry, have children, own horse, "a nice job in which I can use my brains"

Funding information This research has been funded by the Education for Learning Societies focus area at Utrecht University.

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Current themes of research:

Processes of learning. Collaboration and work across contexts. Continuities and discontinuities in interest and identity development over time and transition.

Most relevant publications in the field of Psychology of Education:

Akkerman, S. F., & Bakker, A. (2011). Boundary crossing and boundary objects. *Review of EducationalResearch*, *81*(2), 132–169. doi:10.3102/0034654311404435.

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Current themes of research:

Embodied cognition. Teacher judgment. Scaffolding. Interest development.

Most relevant publications. in the field of Psychology of Education:

Abrahamson, D., Shayan, S., Bakker, A., & Van der Schaaf, M. (2016). Eye-tracking Piaget — capturing the emergence of attentional anchors in the coordination of proportional motor action. *Human Development*, *58*(4–5), 218–224.

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Smit, J., Gijsel, M. A. R., Hotze, A., & Bakker, A. (in press). Scaffolding primary teachers in designing and enacting language-oriented science lessons: is handing over to independence a fata morgana? *Learning, Culture and Social Interaction*.

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